PATENTS FOR INVENTIONS.

ABRIDGMENTS

OF

Specifications

RELATING TO

AIR, GAS, AND OTHER MOTIVE POWER ENGINES.

A.D. 1635–1866.

PRINTED BY ORDER OF THE COMMISSIONERS OF PATENTS.

LONDON:
PRINTED BY GEORGE E. EYRE AND WILLIAM SPOTTISWOODE
PRINTERS TO THE QUEEN'S MOST EXCELLENT MAJESTY.
PUBLISHED AT THE
OFFICE OF THE COMMISSIONERS [illegible] ATENTS FOR INVENTIONS,
25, SOUTHAMPTON [illegible] OLBORN.

PREFACE.

THE Indexes to Patents are now so numerous and costly as to render their purchase inconvenient to a large number of inventors and others, to whom they have become indispensable.

To obviate this difficulty, short abstracts or abridgments of the Specifications of Patents under each head of Invention have been prepared for publication separately, and so arranged as to form at once a Chronological, Alphabetical, Subject-matter, and Reference Index to the class to which they relate. As these publications do not supersede the necessity for consulting the Specifications, the prices at which the printed copies of the latter are sold have been added.

The number of Specifications from the earliest period to the end of the year 1866 amounts to 59,222. A large proportion of the Specifications enrolled under the old law, previous to 1852, embrace several distinct inventions, and many of those filed under the new law of 1852 indicate various applications of the single invention to which the Patent is limited. Considering, therefore, the large number of inventions and applications of inventions to be separately dealt with, it cannot be doubted that several properly belonging to the group which forms the subject of this volume may have been overlooked. In the progress of the whole work such omissions will, from time to time, become apparent, and be supplied in future editions.

This volume contains Abridgments of Specifications to the end of the year *1866*. From that date the Abridgments

will be found in chronological order in the "Chronological "and Descriptive Index" (*see* List of Works at the end of this book). It is intended, however, to publish these Abridgments in classes as soon as the Abridgments of all the Specifications from the earliest period to the end of 1866 have appeared in a classified form. Until that takes place, the reader (by the aid of the Subject-matter Index for each year) can continue his examination of the Abridgments relating to the subject of his search in the Chronological and Descriptive Index.

As the title intimates, the present work contains Abridgments of Specifications relating to all varieties of motive-power engines except steam engines, hydraulic engines and motors, and electric or magnetic engines, which will be found respectively in the series entitled "Steam Engine," "Hydraulics," and "Electricity and Magnetism." The main portion of this volume describes inventions for producing motive-power through the agency of air, gas, and all elastic fluids (except steam) by the expansion or contraction, by the generation, by the combustion, or by the explosion of any of these agents,—also by the influence on machinery of currents of air artificially produced, or of the natural motion of the atmosphere. The other inventions comprised relate to projects for obtaining motive power by various means and combinations of different forces. Amongst these may be mentioned the force of gravitation, loss of equilibrium, specific gravity of floats and weights immersed in water or other liquid, ascension of receptacles inflated with air or gas under water, and different schemes (except hydraulic and magnetic) by which the attainment of "perpetual motion" has been attempted.

In accordance with the explanation of the title given above, inventions relating to windmills and their sails are

included in the series, but not those relating to the sails of ships. Pumps and other machines for raising water by the effect of atmospheric pressure are excluded, as also are—fire-engines, force-pumps, &c. ; apparatus for forcing, compressing, and exhausting air or gas ; methods of propelling ships by the expulsion of water, steam, air, or gas ; hydraulic engines of which it is vaguely stated that they are capable of being worked by other fluids or liquids than water ; also apparatus and gearing for transmitting and varying mechanical motions or applying manual or animal power.

In some Specifications rotary and similar engines are described as capable of being worked by water, steam, gas, or any other vapour, fluid, or liquid; in others mention is not made of air, gas, or other elastic fluid than steam ; hence there are omitted engines often very similar to some of those admitted on account of their claiming a wider use of motive agents. For descriptions of such engines the reader is referred to the series relating to the "Steam Engine" and "Hydraulics." Most fluid meters and rotary pumps are capable of being used as motive-power engines when worked by fluids under pressure; there are many such which do not appear in the present series as motive-power engines, but they will be found in the series relating to "Gas" and "Hydraulics."

Forging and stamping machines, machine hammers, and other tools propelled by the direct action of the motive agent (steam, compressed air, or atmospheric pressure in connection with a vacuum) are omitted, and will be reserved especially for a future series relating to working in metals. Similarly rock-boring and coal-cutting machines worked by compressed air are excluded, and will be found in a future series embracing such subjects.

For inventions relating to the following subjects the reader is referred to the "Steam Engine" series:— "atmospheric steam engines," erroneously termed in some Specifications "atmospheric engines;" most of the usual attachments of steam engines and their boilers which are capable of being used with other engines, for example, pressure guages (although many are expressly stated to be equally applicable for indicating the pressure of gases or other elastic vapours than steam when used expansively as a medium of power); valves for steam engines and the mechanism for working them, capable of being employed in engines worked by other elastic fluids; and likewise general methods of lubricating pistons, valves, &c.

Pneumatic motors for any special and subsidiary application, as, *e.g.*, the "pneumatic lever" for the organ keyboard, are not included in the present work, but will be found in those series with which they are more closely connected. Inventions relating to the use of reservoirs for compressed or rarified air for working locomotive or other engines are included; but methods of atmospheric or pneumatic railway propulsion, which do not embrace a new or improved locomotive engine, are excluded.

The Abridgments marked thus (* *) in the following pages were prepared for another series or class, but as they also relate to subjects belonging to the present series, they have been reprinted in this volume.

B. WOODCROFT.

July, 1873.

INDEX OF NAMES.

[The names printed in *Italic* are those of the persons by whom the inventions have been communicated to the Applicants for Letters Patent.]

INTRODUCTION.

The specifications abridged in this series relate to the various efforts which have been made to obtain motive power from the atmosphere and its currents, and to introduce some motive agent more convenient and economical than the steam engine. The most important class of inventions, and the one in which most success has hitherto been attained, comprises the various methods of applying air, either in substitution for steam or in conjunction with it, or as a means of applying motive power already obtained to some distant point, or, thirdly, in utilising by sails, vanes, or other means, the force of the wind or of currents artificially produced. It is proposed accordingly in this introduction first to give some account of the history and knowledge of the various properties and laws regulating the pressure and expansion of air and aeriform bodies, in the next place of the discovery of the different bodies, gases, volatile fluids, and explosive compounds, most frequently mentioned in this series of Abridgments, and lastly, to glance at the recent investigations into the theory of force and energy and thus explain the failure of the numerous attempts for obtaining perpetual motion which form a considerable part of the series. All these subjects, however, must be treated with great brevity, as any one of them would if dealt with at a length proportioned to their interest or importance extend far beyond the usual limits of an introduction.

The discovery of the pressure of the atmosphere appears to have been made by Ctesibius, who lived about the middle of the third century B.C.

Hero of Alexandria, who is reported to have been his pupil, wrote a work on pneumatics in which many of the effects of this pressure are mentioned. The increase of pressure and subsequent diminution of pressure and rarefaction caused by heat as in cupping glasses are also referred to. And the effect of a vacuum, the construction and effects of various syphons, the construction of a valve, the compression of air by a column of water, syringes for compress*ing or rarefying,*' and a fire-engine consisting of

two cylinders with pistons whose rods are attached to the ends of a beam, are also described. The most celebrated instruments referred to, described by Hero, however, are a steam engine in which a hollow axle is made to revolve by the escape of steam from two openings, pointing in opposite directions and placed on the opposite ends of a tube perpendicular to the axle; and secondly, an instrument moved by sails like those of a windmill.

The windmill does not however appear to have been applied to any useful purpose by the ancients. It is said to have been first extensively used in Holland, probably for the purpose of draining the flat lands of that country. It will be remarked that in most of the earlier specifications considerable stress is laid on the applicability of the invention to raising water.

The theory that the atmosphere had weight was first promulgated by Galileo and by Baliani in 1630, and by Descartes in the following year.

In 1643 Torricelli shewed that the column of quicksilver which could be supported in a tube was shorter than the column of water which could be similarly supported, and suggested that the rising of liquids in an exhausted tube was due to the pressure of the atmosphere.

1647. The theory was confirmed by Pascal, who experimented on the height of the column of quicksilver at the top of a church steeple in Paris, and by Perrier, who, at his suggestion, proved the pressure to be less at the top of the Puy de Dome than at its base.

1654. Otto Guericke exhibited his air pump. An account of its construction was published by Schott in 1657. Boyle, about the same time, invented an air pump of a better construction. His attempts were begun before, as is said, the description of Guericke's pump was published, but he was not successful until after he had received some accounts from Schott of Guericke's pump.

The weight of the air had been previously attempted to be ascertained by Galileo and by Mersenne, by weighing bottles from which the air had been attempted to be exhausted. No approach to accuracy was made till Boyle's experiments were published.

1662. Boyle in his "Defensio Doctrinæ de Aëre," appended to "New Experiments, &c.," published this year the result of his experiments to prove that the pressure of air at a constant temperature varied inversely as its volume. The priority of the dis-

covery has been attributed to Marriotte, but his work "Essai sur "la nature de l'air" was not published till 1676 or 1679. 1699. It was first shown that unequal masses of air whose densities are the same expand in the same measure by the same degree of heat. Boyle and Sir Geo. Shuckard had previously called attention to the fact that the pressure of air increases with heat, and had endeavoured to ascertain the increase of volume produced by an increase of temperature of 1° of Fahrenheit.

In 1703, Amontons showed that air is expanded by heat nearly in a direct ratio of its density. The law, that all permanent gases dilate equally with heat at the same density, seems to have been first made by Charles. Both these discoveries are often attributed to Dalton or Gay Lussac, who published their investigations of the subject about 1802.

Of the permanent gases which are used in the inventions comprised in this series, either as a substitute for air or mixed with it or oxygen, and used to generate force by explosion or combustion, the first to be studied was carbonic acid or fixed air. Black, in 1755, maintained that chalk is composed of an air or gas united with lime, and shortly afterwards distinguished between caustic and commercial alkalies, showing the difference to consist in the presence or absence of this gas. That various kinds of air existed was, however, known previously. Several different sorts, are mentioned in Boerhaave's work on chemistry, including those produced by the action of vinegar on chalk, and another produced by the action of spirit of nitre on iron. (*See* English ed., 1735, p. 310.)

In 1765 the pneumatic trough was invented by Cavendish, who was thus enabled to study the properties of different sorts of air, and in the following year published in the Philosophical Transactions, p. 141, accounts of the fixed air discovered by Black (carbonic acid gas as it has since been named), and the inflammable air (hydrogen) obtained from the bubbles seen in rusting iron and other metals.

Priestley soon afterwards described carbonic oxide and nitrous air (oxides of nitrogen) 1772. The properties of the last were more fully investigated by Davy in 1809. The properties of oxygen (dephlogisticated air) were examined by Priestley in 1774, and by Lavoisier and Scheele in 1775. It had been first obtained pure by Bayer from the calx of mercury.

Gaseous ammonia was obtained by Priestley in 1774, and hydrochloric acid by him in 1772.

Chlorine by Scheele in 1774. Its elementary nature was first put forward by Gay Lussac and Thenard in 1809, and by Davy about the same time, and established by some experiments made in the presence of Davy at Edinborough in 1812.

Azotic air or nitrogen appears to have been first discovered by Rutherford in 1772. The discovery is often attributed to Lavoisier who in 1777 demonstrated the composition of atmospheric air. The composition of fixed air was discovered by him in the same year.

The decomposition of nitrous acid into nitrogen and oxygen was discovered by Cavendish in 1785. He announced his discovery to Berthollet in France, and received simultaneously from him the news of his discovery of the composition of gaseous ammonia.

The composition of water was discovered by Cavendish about 1781. His attention seem to have been called to the subject by Warltire, who exploded a mixture of oxygen and hydrogen in Birmingham in April 1781. Cavendish's experiments were not published till 1784, Phil. Trans., p. 119, and the subject in the meantime had been investigated by Watt in this country and by Monge and Lavoisier in France. Watt and Monge both seem to have arrived independently at the same result as Cavendish, and indeed the former claimed (Phil. Trans. 1784, p. 330) and has by some been allowed the merit of priority.

The decomposition of water was effected immediately after its composition had been ascertained.

In several inventions in this series the so-called permanent gases, especially carbonic acid, are used in a liquid or solid form. The possibility of liquefying most of the gases was first shown by Faraday, who succeeded in reducing chlorine in the winter of 1822–3. He and Sir Humphry Davy afterwards liquefied several of the other gases, including carbonic acid gas. Accounts of these were published in the Philosophical Transactions, pp. 170, 189. Sulphurous acid had however been previously liquefied by Monge and Clouet, probably about the end of the 18th century, and chlorine by Northmore in 1805 or 1806. He published an account of his experiment in Nicholson's Journal, vol. xii. and xiii. In 1844 Faraday again took up the subject and succeeded in reducing several other gases to a solid or liquid state. Oxygen and hydrogen have hitherto resisted all attempts at condensation.

Several of the inventions comprised in this series relate to the *use of vapours of different* liquids in the place of steam, economy in

fuel being sought by employing liquids more volatile than water. Of the liquids more usually suggested the earliest known is alcohol, which is present in all wines and fermented liquids, and has thus been to some extent known through all ages of which we have any authentic history. It could not however be obtained in any separate state until after the invention of distillation, a process which though doubtfully mentioned by Aristotle was not known till some time after the Christian era. A recipe for its preparation from the distillation of some occult substance, which has been presumed to be grains of corn, was given by Rhases about the end of the 9th century. Ortholain, in a work published in 1358, gives directions for the preparation of spirit (aqua vitæ) of different strengths, and also for the preparation of its prime essence, by which pure alcohol seems to be intended. Some time after its introduction great medicinal powers were attributed to it, and it was even thought by some to be the long sought for elixir of life, whence indeed the French name is derived. Belief in its efficacy continued down to the 16th century.

Ether appears to have been first noticed by Basil Valentine about the commencement of the 15th century. In a treatise on the preparation of medicaments he notices the fragrant substance produced by the distillation of a mixture of spirits of wine, oil of vitriol, and other substances. Its discovery has also been attributed to Frobenius. Its preparation was described by Valerius Cordius in 1540. According to Hoefer Dict. de la Chimie, p. 389, it did not till about 1720 became generally known in England, and rather later in Germany. It was studied by Scheele who published a paper on it in the Nova. Acta. Acad. Reg. Suec., 1782.

Bisulphuret of carbon was first discovered by Lampadius in 1796, and afterwards studied by Marcet and Berzelius, Phil. Trans., 1813, p. 171.

Chloroform was discovered by Soubeiran in 1831, and in the next year by Liebig. Its use to produce insensibility during surgical operations was introduced by Simpson in 1847.

The first explosive material used was gunpowder. Greek fire appears to have been known in the eighth century, A.D. The composition of gunpowder, which seems at first to have been known by the same name and to have been confounded with Greek fire, is said to have been first mentioned by Arabian authors in A.D. 1249, *and again in* A.D. 1312, and A.D. 1323. It was clearly

known to Roger Bacon, being mentioned in his Opus Magnum. It is said to have been introduced into Europe by the Saracens, and used in the battle of Crecy, fought on the 26th August, 1346. The Chinese are also said to have used it nearly a century before in their defence of the country against the Moguls. (Gibbon's Decline and Fall, ch. xxxv., Smith's ed., vol. iv. p. 240, &c., ch. lxiv. vol. viii. p. 11. n. 23 and *b*. Hallam Middle Ages, 9th ed., i. p. 340; ch. 3. pt. 2.)

Of the other solid explosives mentioned in this series gun cotton was made first by Schönbein in 1846. His method was patented in England by John Taylor (as a communication from a foreigner) October 8, 1846.

Howard, in 1800, discovered that nitrates of mercury and silver heated with alcohol and nitric acid give fulminating compounds. Liebig, in 1824, made their composition known. The fulminating oxychloride of gold was long before known. Its properties were studied by Berthollet, who was born in 1748.

The laws of motion were first laid down by Newton who in his Principia, published in 1686, enunciated as a principle that in all instruments the action estimated according to the force and velocity of the agent was equal to the reaction of the resisting body estimated according to the velocity, together with the force of resistance arising from friction, cohesion, weight, and acceleration of each particular part. The action here spoken of is what corresponds with that now generally called horse power.

In 1757 or 1759 Black called attention to the loss of heat attending the melting of ice and other bodies, and based on it his theory of latent heat and of caloric, which he supposes to be a very rare fluid, and the material principle or substance of heat. Although this theory is now overthrown, yet the experiments of Black on which it was based first clearly established the convertibility of heat into other forms of force, and thus became a starting point for the dynamic theory of heat. His experiments verifying his discovery were not completed till 1764.

1798. Count Rumford published his "Inquiry concerning the "Source of Heat which is excited by Friction" in the Phil. Trans. p. 80. He showed that the amount of heat capable of being excited by friction was inexhaustible, and that consequently it could not be a material substance, and considered that it was "extremely difficult "if not quite impossible to form any distinct idea of anything "capable of being excited and communicated in the manner that

" heat was excited and communicated in (his) experiments, except " it be motion, p. 99."

1812. Sir Humphry Davy in his "Chemical Philosophy" enunciates the the principle that "the immediate cause of the " phenomenon of heat, then, is motion, and the laws of its com- " munication are precisely the same as the laws of the communi- " nication of motion."

1842. Mayer published "Remarks on the Forces of Inorganic " Nature," and laid down that in the universe are two systems of causes not mutually convertible; the different kinds of matter and the different kinds of force. Forces are convertible, but not destructible, nor can they be created out of nothing. Motion, when apparently destroyed is converted into heat or other kinds of force. In this paper Mayer also attempts to find the numerical solution of the relation between heat and work.

1843. Joule read a paper "On the Calorific Effects of Magneto- " electricity, and on the Mechanical Value of Heat," before the British Association at Cork. It was afterwards published in the Philosophical Magazine. It was there demonstrated experimentally that the mechanical power exerted in turning a magneto-electric machine is converted into the heat evolved by the passage of the current of induction through its coils, and on the other hand that the motive power of the electro-magnetic engine is obtained at the expense of the heat due to the chemical reaction of the battery by which it is worked. In the appendix to the paper is described a method of directly determining the mechanical equivalent of heat or of the weight which by falling a foot, and then being stopped in such a manner that all its force is converted into heat will produce sufficient heat to raise the temperature of a pound of water 1° F. After elaborate experiments made in 1845 and 1847 this weight was determined at 772 lbs.

1843. Grove delivered a course of lectures, the substance of which was afterwards published by him under the title of "The Correlation of Physical Forces." The views there contained were first publicly delivered by him in a lecture given the previous year (January, 1842). He there holds that force cannot be annihilated, but is merely subdivided or altered in direction or character, and that the heat derived from friction or percussion is a continuation of the force formerly associated with the moving body. He also brings together a great number of instances of forces, chemical, electric, magnetic, &c., converted into other physical forces, and lays down as a principle that force cannot

exist without antecedent force, and can no more be created or annihilated than matter can.

It follows from the principles laid down by Newton and others mentioned above, that perpetual motion cannot be attained by any combination of levers, pistons, cylinders, weights, or other mechanical apparatus, for no such apparatus can do any work except at the expense of the capacity for doing work or energy originally contained by it, and must consequently soon stop unless fresh energy be imparted to it either from the combustion of fuel or other means. No prime mover can be in the same state after it has done work as that which it was at first. Nevertheless, even to the present day, numbers of persons endeavour out of mechanical apparatus to construct an engine which will go on working for ever. Some by ingenious combinations of wheels, screws, levers, or other instruments seek to make the power of a descending weight sufficient not only to raise an equal or even heavier weight to the same height as it began to descend from and to overcome the friction of the engine, but also to drive a heavy carriage or move machinery. Others consider that compressed air can be made to expand in a cylinder or to act against vanes with power enough to compress an equal bulk of air to its own original degree of density, and also to raise large quantities of water. Some hope that the external air will rush through a peculiarly shaped aperture into a reservoir already containing compressed air whose pressure is much greater than that of the external air.

The views of Mayer, Grove, and Joule have been experimentally verified and have been accepted and worked out in a number of ways by Sir W. Thompson, Helmholz, and others. If the knowledge of them were generally diffused it would save great loss, both of thought and labour now expended in searching after self-sustaining engines and machines that will go for ever.

AIR, GAS, AND OTHER MOTIVE POWER ENGINES.

A.D. 1635, March 9.—N° 79.

BARTON, William.—" Skill of makeing engins, w^ch being put " in order, will cause and mainteyne their owne moc̄ons with " continuance and without any borrowed force of man, horse, " wind, river, or brooke, whereby many severall kindꝭ of excellent " rare workꝭ may be ꝑformed to the greate good and benefitt of " the cōmon wealth, the like cause and meanes of which con- " tinuance of moc̄on hath not beene heretofore brought to " ꝑfecc̄on."

[No Specification enrolled. Letters Patent printed, price 4*d.*]

A.D. 1662, March 12.—N° 135.

WAYNE, Ralph.—" An engyne which, with the perpetuall " moc̄on of itselfe, without the help or strength of any person or " creature, will not only dreyne great levellꝭ of vast quantities of " water, but alsoe mynes of fifty fathom deep or more."

These letters patent extended to England, Scotland, and Ireland, and were granted conditionally on the inventor paying into the exchequer "the yearely rent or sūme of four poundꝭ."

[No Specification enrolled. Letters Patent printed, 4*d.*]

A.D. 1674, February 27.—N° 174.

JOHNSON, John.—" A new way or wayes, or a new manner or " manners of moc̄on for a windmill or windmills, or winde engine " and wind engines, never yet practized in this nation, by which " may be ꝑformed the raising of water to great heightꝭ, the " draining of mines and drowned groundꝭ, and other thingꝭ, " for the great advantage of the publique, and at a lesser charge, " and in a more convenient manner then any other yet practiced."

[No Specification enrolled. Letters Patent printed, 4*d.*]

A.

A.D. 1684, November 12.—N° 243.

HECKFORD, NATHAN.—"Makeing sailes or vanes to go the "horizontall way, serveing for windmills, horsmills, and water-"mills, and for seuerall sorts of engines for draineing of lands, "pitts, mines, and many other uses, att cheaper rates then euer, "which sort of vanes or sailes are such as were neuer heretofore "used in any of our dominions."

[No Specification enrolled. Letters Patent printed, 4*d.*]

A.D. 1693, March 3.—N° 315.

HADLEY, JOHN.—"An invention whereby a motive power or "faculty is obtained from the ebbing and flowing of the water "operateing on a vessell floateing thereon, which said vessell, by "its riseing and falling with the water, gives motion to all manner "of movements, as mills, engines, &c.; an invention of hori-"zontall wheeles, or engines, to move in or vnder the water, "by the water, or out of the water, by wind, differently framed "as the worke may require; an invention of raiseing and letting "downe all sorts of vertical wheels of comon vse, rendring "them thereby more vsefull in vncertaine waters, by rightly "takeing the streame at all heights of water; an invention of "egines moved by wind, vsefull for drawing severall machines and "carriages instead of horses; a contrivance of measureing time "a more compendious way with one wheele onely, which will goe "much more exact than movements with multiplicity of wheeles, "which will be of very great vse and advantage both by sea and "land."

[No Specification enrolled. Letters Patent printed, 4*d.*]

A.D. 1693, November 24.—N° 327.

POYNTZ, JOHN.—"Diverse instruments of wood, iron, steele, "and other materialls for raiseing of water, as well from standing "water as running streames, to goe of itselfe ppetually, to per-"forme any mill worke, or other worke it shall be putt vnto."

[No Specification enrolled. Letters Patent printed, 4*d.*]

A.D. 1724, October 26.—N° 471.

BRENT, JOHN.—"A wind engine or machine, which would be "vsefull in occasioning motion to all sorts of mill work, and for

" divers other vses and purposes, far exceeding all wind engines " hitherto practised whose fanes move horizontally, and are so " disposed as to work with the wind blowing from any point of " the compass, without turning or altering the position of the " said engine or house thereto belonging."

[No Specification enrolled. Letters Patent printed, 4d.]

A.D. 1726, July 21.—N° 486.

ROWE, JACOB.—" An engine for the more effectuall raising of " water, both in quantity and height, acted either by generated, " expanded, or compressed air, which will be of considerable " service to the subjects of our kingdomes and plantačons; that " the petitioner hath likewise proposed a method for the further " improvement of the use of fire, whereby all sorts of vessells with " water, or other liquids will suddenly be made hot, with consider- " ably lesser quantity of fuel than usual, which may be of benefit " in saving charges to our subjects in general, and more especially " to some particular trades in which fuel is a very great part of " their expence."

[No Specification enrolled. Letters Patent printed, 4d.]

A.D. 1728, November 21.—N° 505. (* *)

PAYNE, JOHN.—" A new engine to be moved by pressure of " the air into any building where large fires are made use of, as in " glass houses, or any other buildings for large works, where by " those fires the air is rarified or the elasticity thereof within the " building is in a great measure destroyed, which occasions a " pressure of air from without through an avenue into the " building of sufficient force to turn or drive a wheel, something " like a large water wheel, that will grind corn, move large " hammers, raise water, or performe any other worke that is done " by the force of wind, water, or horses, &c."

" The form of my engine above-mentioned is made in manner " following, videlicet:—A large wheel fixed to an axle-tree is hung " in a frame on the outside of the building, so that the wheel " will be in a perpendicular or other position, and on the extreme " or outer parts of the said wheel is to be placed fanes or padles of " a proportionable length and breadth to the bigness of the wheel " and avenue through which the air is to pass into the building

" or case, for that purpose to direct the air in a right course, so " as it may have the greatest force on the extreme or outer part " of the wheel and padles, which will give the same a very strong " circular motion, sufficient to move other machinery works for " the purposes mentioned in the said letters patent."

[Printed, 4*d*. No Drawings. See Rolls Chapel Reports, 6th Report, p. 118.]

A.D. 1729, March 10.—N° 507.

BEWLEY, Thomas, and HOLTHAM, Thomas.—" A certain " new engine or machine for raising of water more extensively by " alternate expulsion, rarefaccon, or exhausting of air, and pres- " sure of the atmosphere, whereby townes and gardens may be " supplyed with water, and mines, pitts, docks, and fenns, &c. may " be emptied and drained by a more expeditious and cheaper " method than hath been invented or vsed before."

[No Specification enrolled. Letters Patent printed, 4*d*.]

A.D. 1729, May 16.—N° 511.

HANKSBEE, Francis.—" A new method of applying the cen- " trifugal force of a body moving in a curve line to the moving " of all the various kinds of mechanical and hydraulical engines " or instruments which are now in vse or that may hereafter be " invented, by the application of which power the effects of all " the aforesaid engines will be rendered much greater, and withall " lesse expensive, then they are at present."

[No Specification enrolled. Letters Patent printed, 4*d*.]

A.D. 1736, November 15.—N° 555.

PAYNE, John.—" Method of expanding fluids." In a bottom pot, or vessel made of iron or other metal, is placed a vessel with spouts called a dispenser, which is made to move in a circular or other motion. Grates, plates, and bars of iron or other metal are placed in the bottom pot for the better support of the dispenser and for easier dividing and rarifying the fluid. The bottom pot is to be heated to a great degree of heat and kept continually so while in use. Water, air, or other fluid forced into the bottom pot or into the dispenser, is by the dispenser moved as aforesaid or by some other way dispensed round the

sides and bottom of the bottom pot and expanded or rarified into elastic steam or vapour which is to pass out of the same bottom pot, and to be applied to give motion to "hydraulo-pneumaticall" or other engines.

Some years after this period the Patentee described his invention to the Royal Society. From that account we learn that his boiler was shaped like a balloon. Its middle portion was encircled with a current of flame and smoke from the furnace. A small revolving wheel, like a Barker's wheel, inside the balloon, jetted water from its circumference upon the highly heated portion of the inner surface of the balloon, and converted it, as it fell, into steam. The fluid that was not rarified fell to the bottom of the vessel, and was removed by a pump. He says he rarified 90 gallons with 112 pounds of coal. (Phil. Trans., p. 828, A.D. 1747.)

[Printed, 4*d*. No Drawings. See Rolls Chapel Reports, 6th Report, p. 119.]

A.D. 1737, June 17.—N° 558.

STEPHENSON, David.—"Improvement of mechanicks and "hydraulicks." The problems proposed are, generating motion and force in solid bodies and in fluid bodies at rest, collecting and accumulating motion in bodies actually endowed with some degree of motion, diminishing friction, and constructing machines so as to render the communication of the power to the resistance in the most commodious manner. The method for solving the first case is by having a strong vertical axis of metal, about the middle whereof is fixed a circular wooden plain of three to sixty feet in diameter, having weights from a hundred pounds to a hundred tons placed on the circumference. To the bottom of the axis is fixed a cylinder from one to six feet in diameter which is fitted to the bore of a cylindric vessel filled with water, and having a pipe leading to a second vessel also filled with water and elevated from ten to a thousand feet above the first. The axis is raised and kept suspended by the presence of the water and may now be easily put into a circular motion with all the weights hanging thereon. The great quantity of motion thus accumulated in the axis may be transferred and communicated for giving motion to all kinds of machines. The axis may also be raised by a cylindrical wooden vessel fixed on the axis and immersed in a reservoir of water or by means of the pressure of mercury. Fluids

may be set in motion by having a large circular vessel fixed upon a vertical axis raised in the manner mentioned. The vessel has two upright concentric sides and round the outer side of the moveable vessel vertical water wheels are placed. Upon the aforesaid principles of putting fluid bodies into a circular motion the same will besides acquire a centrifugal force which may be applied for producing a vacuum within a cylindrical metal barrel.

The force of the wind may be accumulated by means of a vertical axis of wood furnished with four or six sails which may be made to open out in moving along the wind and to shut or furl inwards in moving against the wind, or may be made to turn on an horizontal axis so as to present their broad sides to the wind only when moving with it. The axis with its furniture of sails is proposed to be raised up by the pressure of water or quicksilver in the manner described.

Draughts and models are referred to at the end of the Specification.

[Printed, 6*d*. No Drawings.]

A.D. 1738, June 24.—N° 561.

KAY, John.—"An upright wind mill." This consists of two upright posts fixed in the ground and a cross beam tying them together at their heads. Betwixt the two posts is placed a moving shaft with center pins and sockets, in which shaft are placed eight arms horizontally, to which arms are hung four sails on moving frames, which receive the wind from any point, "and by means "of the sails opening and shutting like a door and a brace or "stay line on the back thereof are in full sail on one side the "shaft and come up edgeways on the other." A cog wheel is at the bottom of the shaft. The force may be increased by adding "one or more teem of arms and sails," and by adding one arm the mill, in case of necessity, may be worked by horses.

[No Specification enrolled. Letters Patent printed, 4*d*.]

A.D. 1745, December 9.—N° 615.

LEE, Edmund.—"A self-regulating wind machine." This is furnished with a "weight which regulates the sails according to "the wind force," a "regulating barr passing through the centre "of the original axes," and "chains from the barr to the sails"

represented in the drawing as fixed to corresponding nearer angles of the sails. Other chains, as represented, pass from the opposite nearer angles to the arms carrying the sails. The weight is fixed to a "regulator" shewn close to "back sails which keep the "machine constantly in the wind." The mode of operation is not described.

[Printed, 6d. Drawing. See Rolls Chapel Reports, 6th Report, p. 122.]

A.D. 1749, May 9.—N° 643. (* *)

LANGWORTHY, Richard.—"A machine which is be turned "by the winds only, and of such contrivance and purchase that "it will draw and extract with great ease any weight of water, "metal, ore, or other weight whatsoever from pitts, quarries, and "other great depths; that the said machine will also be very "usefull to persons occupying windmills and stamping mills, and "also on shipboard, for lifting great weights, and in many other "cases will be of great emolument to the publick."

This invention consists of an upright axis carrying vanes, which is mounted in suitable bearings in a kind of frame connected to a circular base, and is partially enclosed in a case, other vanes being also arranged on each side of the case. The last-mentioned vanes are for the purpose of turning the case into different positions when the wind shifts or alters, and so preserving the opening in the case in such a situation as to cause the wind to act in the required manner upon the vanes on the upright shaft, the other vanes being also adjustable by means of ropes or chains. These vanes, as well as the moveable case, are furnished with "wheels "or trucks," which facilitate their being moved. On the lower part of the axis is a cog and spur wheel, for the purpose of driving the machinery requiring to be actuated.

[Printed, 6d. Drawing. See Rolls Chapel Reports, 6th Report, p. 123.]

A.D. 1769, March 14.—N° 921.

MOORE, Francis.—"Machines or engines made of wood, iron, "brass, copper, or other metal to be wrought or put in motion "by fire, water, or air, with a small assistance of horses or manual "labour, which will be very useful in agriculture, carriage of "persons goods, and navigation by causing ships, boats, barges, "and other vessels to proceed with more swiftness."

[No Specification enrolled.]

A.D. 1769, July 13.—N° 933.

MOORE, Francis.—"Machines or engines made partly of wood "and partly of iron, brass, copper, or other metal, and constructed "upon peculiar principles, capable of being wrought or put in "motion by force or power without being drawn by horses or any "other beasts or cattle, and will be very useful in agriculture, "carriage of persons and goods, and also in navigation, by "causing ships, boats, barges, and other vessels to move, sail, "or proceed with more swiftness or dispatch than usual."

[No Specification enrolled. See Mechanics' Magazine, vol. 16, p. 135.]

A.D. 1776, April 1.—N° 1124.

McINTOSH, Peter.—"Horizontal windmill with a multiplying "power upon a very different and much superior construction "and broke and stopt in a very different manner from any mill "that has ever yet been invented; the same mill to be likewise "worked with cattle and the wind power to be put upon a water-"mill as occasion may require."

[No Specification enrolled.]

A.D. 1779, June 16.—N° 1228.

MÜLLER, John Dietrick.—"Engine constructed on self-"moving principles." This consists of a double wheel or two parallel frames fixed on one axis, and having two or more corresponding apertures, so that an axis passing through them shall be parallel to the axis of the frames. The interior of each aperture is smooth and circular, and has belonging to it an oblong box fixed to two cylindric pieces, with their axes in the same line, which are exactly half the diameter of the apertures in the wheels and roll on the internal surface thereof. The pieces roll by teeth or trundles fitting into other teeth on the sides or external surfaces of the apertures. Each box has each of its opposite sides to which the cylindric pieces are fixed perforated with three holes of an oval shape, in which a weight having two cylindric parts rolls. From the position of these two oval holes when the box comes to a vertical position, the weights will roll further from the centre so as to bring the box to an inclined position and the teeth on the

cylindric axis will act on those in the wheel or frame. The powers generated will depend on the formation and position of the oval holes.

[Printed, 6*d*. Drawing. See Rolls Chapel Reports, 6th Report, p. 164.]

A.D. 1782, April 15.—N° 1324. (* *)

MORLEY, HILLDEBRAND.—A machine to give to mills, clocks, &c. "a constant and perpetual force and motion." This machine consists of a large wheel having divisions on its rim, like a water wheel, each large enough to contain a round wooden or hollow metal ball. This is connected by pullies with a smaller wheel, which drives a third wheel, to which are attached lifters. As the large wheel revolves, thereby causing the others to revolve, the balls fall off, and rolling down an inclined plane or spout, enter a tall square or tube filled with quicksilver or some fluid, and, from their lightness, rise to the surface, and are lifted out by the lifters, and then roll down another inclined plane or spout, and reload the large wheel. There is also a small wheel attached by spokes to the rim of the large wheel, and thus kept in motion. The machinery is fixed to a framework.

[Printed, 4*d*. No Drawings.]

A.D. 1783, November 15.—N° 1399.

WISEMAN, BENJAMIN, the younger.—"Sails for windmills." In this invention four horizontal levers are attached to an upright shaft, and at the end of each lever is a mast carrying a sail. Between the levers are fir poles or "stays." Each sail is kept in position by a sheet line passing from it's corner to a pulley at the extremity of the stays and thence into the mill; and it is drawn up and down by a halyard which passing over a pulley at the top of the mast and thence along the mast lever and shaft comes down inside the mill and is attached to an iron ring and hooked on to an half staple at the foot of the shaft. From the upper part of the shaft is hung a metal ball, connected by a wire to the lower extremity of the vertical arm of a bent lever, having its centre on the shaft and the other arm perpendicular to the shaft. This arm is graduated and a regulating weight can be made fast to any part of it. When from the force of the wind the velocity of the

shaft exceeds a certain amount, the centrifugal force of the ball overbalances the regulating weight and draws forward the lever so as to strike a trigger which lets down a catch, and this as the iron rings of the halyards revolves past forces them off the half staples. Thus the sails are in case of storm struck of themselves. A horse may be used to turn the shaft, and a provision against an accident from a sudden gale is described.

[Printed, 1s. 4d. Drawings. See Repertory of Arts, vol. 4, p. 12; Rolls Chapel Reports, 6th Report, p. 169.]

A.D. 1784, April 10.—N° 1426. (* *)

DE KEMPELEN, Wolfgang.—"A reaction engine set in " motion by fire, air, water, or any fluid, and applicable to any " other machine or engine requiring a moving power in any " direction whatsoever."

The principle of this machine consists in producing motion by either steam or water under pressure being made to issure from small apertures at the opposite extremities of a horizontal tube, and thus to cause the cylinder, which is balanced at its centre on a moveable joint, to revolve.

[Printed, 6d. Drawing. See Rolls Chapel Reports, 6th Report, p. 168.]

A.D. 1785, January 15.—N° 1460. (* *)

GULLETT, Christopher.—"New invented eolian engine; " for working pumps, mills, ginns, whyms, cranes, or other " machines by the force and action of the wind and the power of " condensed air."

"The occasion of this invention was the bad behaviour of a " person who had contracted for drawing the water from a par- " ticular part of the said mines (lead mines in the parish of " Beerferris) by a horse engine and water barrels, and from a dread " of listening to the recommendation of a fire or steam engine, " on account of its great expence. The first idea of it was from " looking at a shuttlecock, and considering how it was bandyed " forward and backward through the air by the feathers' edges " being placed in a particular position, and extending that idea " to thin plates of iron or boards fixed obliquely at the end of " long levers, resembling a shuttlecock, and the first sketches were

"drawn upon that plan." Subsequently, alterations were made until the wheel was perfected. The inventor thus describes it:— "Figure to yourself a vertical undershot water wheel, or the "wheels of the water works at either of the London bridges, "change the position of the wheel by standing its axis upon its "end, then the axis and float boards, which are now both hori-"zontal, will be made erect and to stand perpendicular, and if "the rims or rings of such a water wheel were back'd by having "boards nailed on the within sides (with intervals of about two "inches between them, as above described), it would serve very "well for an eolian engine wheel, and the current of air and wind "rushing perpendicularly between the float boards or buckets "when standing perpendicular will resemble and be similar to the "current of water forcing round its horizontal floats. After "this familiar idea of it, a drawing or perspective view of it would "be wholly unnecessary, and for that reason only is omitted."

[Printed, 4d. No Drawings. See Rolls Chapel Reports, 6th Report, p. 171.]

A.D. 1785, May 9.—N° 1478.

BRAMAH, Joseph.—The engines described in the specification which may be worked by the expansive powers of condensed air, steam, or any other kind of elastic vapour, &c., consist of two metal cylinders, one within the other. The small cylinder is moveable about its axis, and has attached to it, a piston fan which exactly fills the space between the two cylinders. A valve moving on an axis in the outer cylinder also fills that space. Before working the engine the air must be exhausted out of all its parts. The vapour is then admitted into the interior of the inner cylinder and passes into the space to the left of the valve, and between it and the piston or fan, and by its expansion forces the piston to revolve. The condensing pipe opens into the outer cylinder by an aperture a little to the right of the valve. The valve in the outer cylinder is made to move back so as to prevent its being struck by the piston, and the motion is continued while the piston is passing the valve by means of the fly wheel. The aperture from the inner cylinder is furnished with a valve which is opened and shut during proper parts of the revolution by a lever striking against a projecting part in the corner of the vessel. The vapour is condensed by travelling through a long tube, and then returns by its own weight into the boiler, to effect this there are two valves, one

at the entrance into the boiler and the other at some distance from it which prevent the returning liquid being forced back. Between the two valves is inserted the end of another pipe communicating with the outer cylinder a little to the left of the valve, in it and furnished with a sliding valve or piston. When the vapour is admitted into the outer cylinder, the pressure by means of the sliding piston becomes nearly the same in the condensing pipe between the valves as it is in the boiler, and the condensed liquid falls by its weight into the boiler. This construction affords the advantage that instead of water may be used any kind of spirituous liquor or other fluid that is easier to evaporate or expand.

[Printed, 1*s*. 6*d*. Drawings. See Practical Mechanics' Journal, vol. 1, p. 285. Rolls Chapel Reports, 6th Report, p. 171.]

A.D. 1785, June 11.—Nº 1484.

HILTON, Robert.—"Improvements in wind mills." The sail cloths are fastened at each end by iron rings to rods at the extremities of the sails. Furling and unfurling pullies are placed on one side but opposite surfaces of the sail, they and the purchase wheels are fast on the same axis. Cords are fastened to the furling pullies and unfurling pullies and are made fast to the side of the cloths. To each sail are two drums turned by a small toothed wheel. These revolve with the wind shaft. A rope of which the end is coiled on one drum is made to pass round each of the purchase wheels, and its other end is coiled in the reverse way round the second drum. Motion may be communicated to the small toothed wheels by a large toothed wheel turning on the same axis as the wind shaft and usually revolving with it. When it is desired to furl the sails while the mill is at work a break is applied to the large toothed wheel which retards its motion, and the drums turning with the small wheels receive and deliver the rope which draws round the purchase wheels, and the same motion is given to the furling and unfurling pullies. To unfurl the sails the large toothed wheel is "exhilerated" by connecting it with a different part of the machinery.

[Printed, 10*d*. Drawing. See Rolls Chapel Reports, 6th Report, p. 170.]

A.D. 1787, February 1.—Nº 1588.

HEAME, Benjamin.—"Method of regulating the sails or vanes " of engines and mills worked by force of wind." This is effected

by means of a weight hung to a "fusee wheel or pulley." The sails are attached to yards moving on masts, "and are made to "hoist or lower as lug sails, try sails, or of various other forms." The weight is connected by means of a frame moving on the horizontal axle, and a rod passing through the whole length of the axle, or braces passing along grooves in the axle to braces passing over pullies at the end of outriggers placed at the extremity of the axle, and which being "fixed to the leeward edge "of the sail will, in proportion to the power of the wind acting "upon them, draw them either to a greater or less degree of "obliquity to the wind and thereby increase or diminish its "power, which will always be just sufficient to balance the "weight." The weight may also be placed outside on the opposite side of the sails from the mill.

[Printed, 10*d*. Drawing. See Rolls Chapel Reports, 6th Report, p. 176.]

A.D. 1787, November 15.—N° 1628.

MEAD, THOMAS.—A regulator for wind and other mills. The wind shaft turns an upright bar carrying a circular top, to which globes are attached by moveable bars. Cords are attached to the globes and to a moveable collar on the bar, which is again attached to a moveable collar on the wind shaft. A cord passes from the latter collar to furling and unfurling pullies arranged as in Hilton's patent, and after passing round these goes through a groove under the collar on the shaft over a pulley at the end of the shaft, and returns back and is fastened to the collar of the shaft. As the velocity of the mill increases, the globes fly off from the centre of the bar and draw up the collar on the bar, thereby drawing the collar on the shaft nearer the pulley at the end, and also drawing one end of the cord which turns the furling pullies, and the sails are thereby furled up in proportion to the velocity. For unfurling the sails there are springs which pull the collar on the shaft nearer to the sails.

[Printed, 10*d*. Drawing. See Rolls Chapel Reports, 6th Report, p. 177.]

A.D. 1789, October 29.—N° 1706.

HOOPER, STEPHEN.—"Machinery for regulating the power "and motion of wind and other mills." One end of the sails

"are fastened to cross lathes of the vane or sweep, the other to "rollers to roll the sails upon when wanted." "In the centre "of each end of the rollers are small gudgeons which work in "centres in two rods extending lengthwise on each side of the "length of the face of the vane."

These rods are set in motion by other rods moved by necks working under and over a pinion which is connected with, and set in motion by means of, an endless string passing over a pulley within the mill. "These sails will attend themselves when the mill "is at work by a weight connected with the extreme ends of the "rods" at the sides of the vane, "so that when the weight by the "velocity of the vanes or sweeps is forced out so as to over-"power a counter weight fastened to a rope which works round "a spiral wheel fixed on the cross shaft" to which the pulley is fixed, "the sails roll up in proportion to such velocity, and when "the velocity abates the counterweight overpowers the weight on "the vanes or sweeps and spreads the sails." The sails may also be constructed "extended lengthways on the vane," and "regulated on the same principle."

[Printed, 10*d*. Drawing. See Rolls Chapel Reports, 6th Report, p. 181.]

A.D. 1790, January 15.—N° 1720. (* *)

BRAMAH, Joseph, and DICKINSON, Thomas. — Rotary engine. Improvements on the invention already described, No. 1478. Two cylinders, the larger fixed, the smaller placed within it revolves on an axle; the space between them forms the steam channel. Two plates or sliders moving in grooves made in the smaller cylinder cross each other at right angles; when drawn out each closes the steam channel, and at the same time moves easily and as a piston. Two pipes open into the circular channel, one from the boiler the second from a condenser. The "fixed position" or abutment valve is attached to the outer cylinder, and the sliders or revolving pistons are so arranged that as one, in its revolution, reaches the orifice of the steam pipe, the preceding slide shall arrive at the orifice of the condenser pipe. The slide is returned into the groove in the inner cylinder, as it passes the "fixed position" or abutment valve; the steam, therefore, flows into the circular channel between the abutment valve and a second slider, which acts as a piston and carries

the inner cylinder round with it. The sliders are moved and the condenser valves closed by mechanism fixed on the prolonged axle of the inner cylinder.

2. The sliders or pistons may be projected from the periphery of the outer cylinder, and the re-action valve be fixed on the inner cylinder, which then becomes stationary, and the outer cylinder revolves.

3. The inner cylinder "armed with cross sliders," instead of having its axle in the centre of the outer cylinder may have it " moved as much excentric as to cause its periphery to rub against " the concave of the outer cylinder," and form at the line of contact a steam-tight joint, and the inner cylinder will form an abutment valve and revolving piston. "This machine may be worked " by steam, condensed air, wind, or any other elastic or gravi- " tating fluid." "This machine may be fixed either in a hori- " zontal or vertical direction."

[Printed, 1s. Drawing. See Repertory of Arts, vol. 2, p. 73; vol. 5 (*third series*), p. 419; Register of Arts and Sciences, vol. 4, pp. 170, 235, 410; Rolls Chapel Reports, 6th Report, p. 181.]

A.D. 1790, March 24.—N° 1738.

RUMSEY, James.—"Applying the power of water, of air, and " of steam either separately or together." Part of this invention consists in putting water or other matter in motion by the force of steam or other power and causing it to vibrate in tubes, the effect being produced by and between air, steam, springs or other elastic bodies. Several applications of water and steam power are described, in one of which a moveable cylinder placed within a stationary cylinder is used, and is moved one way by steam and the other by the weight of the atmosphere after the steam has been condensed. In other applications the action of the atmosphere is used to force water through a trunk, or to check its course, or raise it up a tube.

[Printed, 1s. 4d. Drawing. See Rolls Chapel Reports, 6th Report, p. 182.]

A.D. 1790, April 21.—N° 1745.

SCHWIERS, Conradus, and BLYDESTEYN, Isaac.—" Ma- " chine on a self-moving principle." A toothed wheel placed between two stiles or uprights works by means of pinions a double

chain made with joints on each side and bars across equal to the number of the bogs on the wheel. A second wheel, whose diameter is fully double that of the first, works on the same axis, and is divided into a number of receptacles near the periphery. Buckets equal in number to the receptacles are attached to the chain and receive metal balls from the receptacles when at the lowest part of the wheel, which they supply to the receptacles through a gutter near the top of the wheel. These balls by their weight force round the wheel.

[Printed 6d. Drawing. See Repertory of Arts, vol. 7, p. 165.]

A.D. 1790, May 8.—N° 1750.

HAYWOOD, John.—The subject of this patent is a machine with a double or cranked centre fixed to a frame or stand. A wheel revolves round the fixed part of the cranked centre and has fixed to its inner side a series of circular grooves or guides. Levers revolve round the moving centre and are fixed at their extremities to weights or rollers which revolve in the grooves. The distance of the centre of the roller from that of the groove in which it rolls is equal to the distance of the crank from the fixed centre. These grooves have springs which allow the weights to pass only in one direction. The power of this machine may be communicated by fixing teeth or cogs so as to connect it with any mill or engine.

[Printed, 8d. Drawing.]

A.D. 1790, October 16.—N° 1775.

HATELEY, Joseph. — "Pneumatic fire engine edifices" are built in a circular or conical or cubical form, in which tubes or cones there are fire grates erected for rarifying the air therein; by doing so a regular or constant wind is obtained which acts against vanes or sails, and gives motion to them before it gets access into the rarified space. The vanes are arranged "in a "spiral form round a spindle or axis in a semicircular manner, "being placed in a vertical position" while some are horizontal and others placed edgeways. Occasionally the powers of each are communicated to one main axis. In some cases boilers are applied over the fires which supply steam to cylinders, and the

powers arising therefrom are "connected with the powers ob-" tained by the impulse of the external air against the vanes."

[Printed, 4*d*. No Drawings.]

A.D. 1791, October 31.—N° 1833.

BARBER, JOHN.—"Using inflamable air for the purposes of "procuring motion." Coal, wood, oil, or any other combustible matter is placed in a retort, and the smoke or vapour is collected and cooled in a receiver, and is thence conveyed by an air pump to a compresser or regulating bellows which supplies it to an exploder. Common air is injected by similar means in due proportion through another pipe, and the mixed airs being ignited on the application of a match or candle rush out in a continued stream of fire which works the engine and may be applied to every mechanical operation. The steam may also be injected into smelting furnaces or passed out at the stern of a boat or vessel, which is thus driven in any direction. "The fluid steam is con-" siderably augmented, both in quality and velocity, by water "injected into the exploder through a small pipe" which also prevents the inward pipes and mouth of the exploder from melting. The air and water pumps are worked by the fly wheel.

[Printed, 10*d*. Drawing. See Repertory of Arts, vol. 8, p. 371.]

A.D. 1792, June 14.—N° 1890. (* *)

SILVESTER, GEORGE.—1. A horizontal windmill consists of an upright shaft, with two sets of arms revolving upon it, and which carry between them long vertical vanes. By means of a crown wheel on the shaft gearing into a pinion on a spindle turning a wheel on the axis of each vane, the vane is caused to present to the wind its flat side when it is on one side of the main shaft, and its edge when it comes round to the other. To equalize the speed, a directing vane having a regulating weight attached to it keeps the machine in the most favourable position for the action of the wind, but when this is too strong, the upright shaft is partly turned round by the pressure of the wind upon the vane, and the action of the crown wheel on its top thus causes the mill vanes to be presented in a less favourable position for the action of the wind.

2. Feathering paddles. "The same motion may be likewise "applied to floats of water wheels, or the working of common "boats without oars;" the arms carrying the vanes or paddles would then turn vertically.

3. A horizontal windmill with sails or vanes turning on pivots connected by two endless chains, which move horizontally round wheels, are made with an unequal amount of surface on the two sides of the axis of each, so that the wind blows them open, and they are kept in an oblique direction towards it by cords, while the wheels are moved round.

[Printed, 10*d*. Drawing.]

A.D. 1792, December 22.—N° 1929.

PARKER, THOMAS.—Engine to be wrought by means of air and water. A continual stream of air is produced by an air pump, and is conducted through a pipe passing an oven or fire for the purpose of heating the water. The pipe ends in a cistern of water, in which is a wheel of buckets, and the heated air entering into the buckets by its ascending force, produces a rotatory motion. The heated air may also be conducted into an air vessel in a cistern, which it will cause to ascend. There is "a stud for opening the valve as the air vessel ascends, the "air escaping by the opening of the valve, and the air vessel "being made of a sufficient weight to sink to the bottom of the "cistern," "by which the air vessel acts in the manner of the "piston of a steam engine."

[Printed, 6*d*. Drawing.]

A.D. 1794, March 6.—N° 1979.

MEAD, THOMAS.—"Exerting, putting, and continuing in "motion pneumatic chemical apparatus."

When the air, gas, or other elastic fluid comes in contact with the ignited combustible matter, or feels the power of heat in a confined space, it becomes decomposed and expanded by the heat, and by the evolution and expansion of its component parts acts upon a piston and exerts power. Into a part of the cavity occupied by the expanded fluid a solid body being then introduced displaces and transfers the air, gas, or fluid that has sustained combustion or been expanded by the heat to that part of the apparatus which is kept cool, and there the fluid becoming re-

composed and condensed, forms an imperfect vacuum, then the atmosphere presses upon and forces back again the piston. An apparatus is described that will serve to illustrate or exemplify the methods of applying the principles so as to exert power. It consists of two vessels in the form of hollow cylinders, one of which is made to fit accurately into the other so as to admit of being moved up or down on it air tight. Within the two is placed the "transferrer," or solid body in the form of two cylinders, the upper being of the diameter of the interior of the larger, and the lower of the smaller vessel. On the top of this is a small grate. The two vessels communicate by a cavity in the transferrer, and also by a bent tube which can be opened or closed at pleasure. By raising or lowering the transferrer the air is driven into the heated or the cool vessel and made to pass through the ignited combustibles on the grate.

[Printed, 6d. Drawing. See Rolls Chapel Reports, 6th Report, p. 189.]

A.D. 1794, May 7.—N° 1983. (* *)

STREET, Robert. — "Method to produce an inflammable "vapour force by means of liquid air, fire, and flame, for com-"municating motion to engines, pumps, and machinery."

The apparatus consists of an iron cylinder, in which works a solid iron piston, made to fit the cylinder. The bottom of the cylinder is heated by a stove. A few drops of spirit of tar or turpentine are poured on to the hot bottom of the cylinder, and instantly the liquid is converted into vapour. At the same time the solid piston is elevated by means of a lever so far as to cause a quantity of air to be sucked in through an aperture producing an explosive mixture within the cylinder, which is ignited by a light carried by the lever and exploded, thereby forcing up the piston and actuating the end of a lever attached to it, which works a pump or other machinery.

[Printed, 6d. Drawing. See Repertory of Arts, vol. 1, p. 154.]

A.D. 1794, June 2.—N° 1994.

FITZGERALD, William.—"An apparatus by which ships and "vessels may be discharged of water by means of their own "motion, and which is also useful and applicable to very many "purposes in pneumatics, hydrostatics, and hydraulics." This system comprehends, first, a revolving motion produced out of

the ship by the action of the water on a system of sails and spars on a beam immersed in the water.

Secondly, a pendulous or alternate motion produced by a swinging lever with a weight at its extremity, both of iron or other suitable material. This is fixed on a cranked axis, and gives the cranks a vibrating motion which is communicated to a vibrating lever on the axis of motion of a pump.

Thirdly, several descriptions of pumps as described in the Specification. These pumps may be used for discharging water from a mine. They must then be worked by a shaft moved by wind, steam, animal strength, or other power.

[Printed, 2*s*. 6*d*. Drawings.]

A.D. 1794, June 28.—Nº 1997.

DUNN, William Bruce.—Constructing and making mills. A ship or vessel is made fast in a stream which turns the water wheels described in the Specification. The mast of the vessel is made to turn in a socket on rollers. Four or more yard arms are fixed round the top, and the same quantity at a sufficient height above the deck. There are "stay cords in sufficient " number to prevent the sails flying through or running from the " upper to the lower yard arm, or what may be better, a netting " of sufficient breadth for my sails to rest on." The miller makes this " work to the right or left hand by hawling the right " or left-hand cords and sails to the windward of the netting." " When the sails are made to flap one over the other the netting " may be saved, a few stay cords will do." The vessel may be sailed by screwing the mast to the bottom and ceiling of the vessel. The water wheel may also be turned into a horizontal mill; the water or air barrels are fixed only to the rim of the wheel by hinges, and rest on the supporters only when in the current in the act of giving power. The inventor also describes attempts made by him to modify his water wheel so that when raised out of the water and placed in a close place where there was not a breath of air, it would go of itself, but these were not successful.

[Printed, 6*d*. No Drawings.]

A.D. 1794, November 22.—Nº 2024.

BANNISTER, John.—The " invention consists in applying the " *power* of air to effect the motion of one or more wheels which

" is to be performed by one, two, or more cylinders, pistons, " bellows, or other machine capable of producing wind sufficient " for the purpose required." The wheel to be moved is represented in the drawing with vanes, placed radially. "The means " of working the bellows, cylinders, pistons, or other machines " to produce the wind may be performed by any of the known " powers."

[Printed, 6d. Drawing.]

A.D. 1795, March 31.—N° 2045. (* *)

BRAHAM, JOSEPH.—" Certain new methods of producing and " applying a more considerable degree of power in all kinds of " mechanical apparatus and other machinery requiring motion " and force, than by any means at present practised for that " purpose."

This invention consists essentially in the employment of a cylinder furnished with a piston, beneath which piston water is forced, or compressed air admitted, so as to raise the piston, and with it any heavy body against which it may be desired to act. The patentee mentions, as a leading feature of the invention, having the pipe which supplies the air or water to the cylinder of much less diameter than the cylinder itself. Several modifications of the invention are described, in one of which compressed air is admitted to the cylinder from a hollow globe, into which it has been previously condensed, while in other arrangements water is driven into the cylinder by a force pump. The apparatus may be applied to a variety of purposes, in addition to the raising of heavy bodies. By having the pipe which supplies the air or water to the cylinder of much less diameter than the latter, the effect of the apparatus is rendered much greater than would otherwise be the case.

[Printed, 10d. Drawing. See Repertory of Arts, vol. 6, p. 289; Mechanics' Magazine, vol. 48, p. 321; Engineers' and Mechanics' Encyclopædia, vol. 2; p. 334; and Smith's Mechanics, vol. 1, p. 107.]

A.D. 1795, September 8.—N° 2064.

PROSSER, JOHN.—" Smoke jacks." A worm, on the axis of which is a fly driven round by the draft or air causes a worm wheel to revolve. On the axis of the worm wheel is a toothed wheel which communicates the motion to an upper wheel to

which the spindle and chain wheel are fixed. On either side of the chain wheel is a screw to be taken out when the jack wants oil. The spindle is hollow and another hole within the body or case containing the worm and other wheels, allows the oil to run out.

[Printed, 6*d*. Drawing. See Rolls Chapel Reports, 6th Report, p. 146.]

A.D. 1795, September 18.—N° 2065.

BRAITHWAITE, JOHN.—"Smoke Jack." In this invention the axis of the flyer is made horizontal; the fans or floats are joined to it by arms to which it is best that they should be inclined at an angle of about fifty degrees. A plate of iron or other metal should be placed either above or below the jack to conduct the air or smoke to the fans in a particular direction. The same effect may be produced by erecting an abutment of brick.

[Printed, 10*d*. Drawing. See Repertory of Arts, vol. 6, p. 1.]

A.D. 1795, December 8.—N° 2076.

MAUNSELL, DANIEL.—Horizontal wind mill. This consists of two engines which may act together or separately. The first has four horizontal arms with sails made of thin boards or frame-work covered with canvass. These arms move on hinges or gudgeons "and being opened by the wind on the side which is "intended to receive its direct impulse present perpendicular "surfaces but are prevented from folding back by the boards" "which strike against four vertical bars." The wings above the arms or upper wings are prevented from closing too far by cords; the lower wings are at liberty. Weights are suspended by rods to the backs of all the wings and are nearly balanced thereby.

The second engine consists of twelve (the number may be varied) vertical boards which are fixed at equal distances round a cylinder and extend within about twelve inches of the circumferences of the top and bottom thereof. Wings whose number is equal to that of the boards are exactly fitted round the cylinder. "They "are suspended on hinges or gudgeons and being opened by the "wind strike with force against the vertical boards by which "they allowed to open only so far as the open wing may form "nearly a right angle with the closed wing" succeeding. "The

" motion of the engine may be stopped by cords fastened to three " adjoining wings which are connected by one rope " passing into the interior of the mill.

A somewhat different modification of the first engine is also described.

[Printed, 8*d*. Drawing. See Repertory of Arts, vol. 7, p. 6.]

A.D. 1797, February 7.—N° 2164.

GLAZEBROOK, James.—Working "machinery by means of " the properties of airs."

Coal air is compressed by a double forcer and is thence conducted to a saturator or tube with several holes enclosed in a longer vessel and covered with warm water through which the air passes. It afterwards goes to a copper vessel heated by flues from a fire and thence to the working cylinder. This is double acting and attached to one end of a beam the other end of which moves the compresser. The piston has a packing of cotton or other suitable materials made air-tight by fluids acting above and below it as follows. The piston has a quantity of rape oil (or other suitable fluid) above a wing, and this oil while the piston is descending is forced by the air above through the packing, but instead of passing by the whole of the piston is stopped by another packing and turned into a cavity in communication with the air under the piston. During the ascent of the piston the oil is driven back to its former position.

[Printed, 1*s*. 6*d*. Drawings.]

A.D. 1797, May 29.—N° 2181.

VARLEY, Richard.—"Perpetual moving power." A wheel with its axle perpendicular is placed in a covered air-tight circular vessel filled with water. A cylinder is placed on the wheel and is furnished with a piston consisting of a circular air-tight vessel, into which the external air is conducted by a jointed tube leading from the axle of the wheel. The air can be extracted from the cylinder through a small tube. On the top or other convenient place of the vessel are two cylinders of a proportional size to that on the wheel, one is a condensing cylinder to compress the water by means of a screw and piston; " the other has its piston sus- " pended at the bottom, and the top part of the cylinders being " filled with air, as the other piston is screwed down this rises

" and condenses the air in the cylinder, the spring of which keeps " the water in the vessel pressed to all parts alike." When the air is extracted from the cylinder on the wheel, the piston which is suspended to a strong spring on the wheel is forced into the cylinder. "By this means the external air is suspended upon " the wheel by the chain the same as a weight, and the spring " of the atmosphere being taken from the cylinder there is nothing " to oppose this weight, there being no spring in water, and this " power may be increased in proportion to the number and size " of cylinders on the wheel and its diameter."

[Printed, 6*d*. Drawing. See Repertory of Arts, vol. 10, p. 9.]

A.D. 1797, October 31.—N° 2200.

BEATSON, Robert.—"Horizontal mills." Four upper and four lower arms are fixed into a vertical shaft. Frames either fixed, or made to slide backwards and forwards so as to be placed nearer or farther from the shaft, are constructed between the upper and lower arms of each side. The space contained within the frames (which the inventor calls the vanes) is filled up or covered with any sort of light thin substance as canvass, linen, silk, paper, or pasteboard, prepared if thought requisite with oil, tar, or varnish, or with thin boards, or plate iron, tin, or copper. The material covering the vanes must not be in one part, but divided into a number of separate small flaps placed or suspended so as to overlap each other a little. All the overlaps being on the same side on the same vane, but on the opposite side on the vane on the opposite side of the shaft. When the vanes exceed five or six feet square or thereabouts, the spaces should be divided into two or more vertical parts or panels. The mills may be stopped and regulated either by a brake or grip, or by opening or shutting all the flaps of the vane at pleasure. This is effected by ropes or chains, fixed to the middle of the lower edge of the flaps, or to pieces of iron projecting from the flaps, or by bars with projections or notches. The mills may be made to regulate themselves by bolts, weights, or perpendiculars fixed to inflexible rods and suspended upon the arms or frames so as to operate upon the sheaves or pinions on ropes that open the flaps according to the velocity at which the vanes are moving.

[Printed, 8*d*. Drawing. See Repertory of Arts, vol. 2 (*second series*), p. 13.]

A.D. 1799, January 5.—N° 2286. (* *)

KENT, John.—" A new or improved method of applying power " to the working of mills and other machinery where power is " required."

The patentee states that he substitutes " weight or pressure in " the room of animal strength." He describes in the first place a wheel, mounted on an axis resting in suitable bearings, and which he calls a " sustaining wheel," on the periphery of which is resting a heavy roller, this roller not resting upon the sustaining wheel directly over the axis thereof, but at a short distance from the point which is over such axis. He then describes the roller as being furnished with a winch, arms, or vanes, by means of which it is caused to rotate, and then goes on to state that " the roller and the sustaining wheel on which its whole weight " or pressure bears, moving with the same quantity of motion " towards each other," the "great difficulty in mechanicks of " gaining power without losing time is overcome by the means " of supplying weight or pressure at or near the centre of gravity, " in the room of animal strength in the usual way applied." He next states that by applying the strength of one horse to the " top " of the roller, " and the horse moving at the rate of three " miles per hour, the power will raise more than eight hundred " tons of water twenty feet high in the space of one hour," and that the machine may be converted into a " perpetual motion," water so raised being discharged into a cistern, and then employed to put in motion a water wheel, the action being continued by the wheel raising its own supply.

The invention is mentioned particularly as being applicable for " raising water for heaving purchases by a windlass or otherwise " on board a ship, and also " for moving barges up the inclined " plane," and certain arrangements are described by means of which the position of the roller on the sustaining wheel may be altered, the amount of pressure exercised by the roller on the wheel being shown by an index hand and a " graduated limb of " a circle."

[Printed, 6d. Drawing. See Rolls Chapel Reports, 6th Report, p. 147.]

A.D. 1799, February 28.—N° 2299.

MEDHURST, George.—" Condensing wind engine." Air is compressed by means of a wind mill and then made to act on the

piston of a cylinder so as to produce a regular and uniform motion. The sails of the mill may be constructed in the usual way or may be fixed between two concentric wings supported by 4 arms, and may be made to fill nearly the whole of the space between such rings. The piston which condenses the air is attached to one end of a beam, at the other end of which is a piece of timber, and on the lower end of this an iron wheel without teeth to run upon an inclining plane. This piece of timber is moved by machinery connected with a wheel on the upright shaft of an ordinary mill, or with a crank on the axis of the sails. " When the wind is strong or the air in the magazine not much " condensed, the inclining plane is to be set at a great angle that " the piston may make a long stroke," " but when the wind is " weak or the air," " strongly condensed," " the plane must be " set at a less angle." The plane is raised and depressed by means of the balls of a centrifugal regulator. The valve which admits the compressed air to the cylinder is made to remain open a longer or shorter period according to the density of the air by a regulator, so that the force the piston receives may be the same.

[Printed, 10*d*. Drawing. See Repertory of Arts, vol. 4, p. 406 (*second series*); also vol. 7 (*third series*), p. 274; Engineers' and Mechanics' Encyclopædia, vol. 2, p. 501.]

A.D. 1799, September 23.—N° 2341. (* *)

BISHOP, JOHN.—"An invention of a new method of creating " a power useful in moving machinery and reducing labour by " means of fire, water, and steam, with or without condensation, " applicable to every purpose where strength is required." Ether or spirits of wine may be used instead of water, as a less degree of heat will generate vapour.

"A simple wheel similar to that of an overshot water wheel " " is hung on an axis in a floom or box so full of water as to cover " the same." "The bottom of the floom or box must be made " of metal or other substances which the fire will not injure, with " a convenient place for a fire, or to receive the heat under the " same. The steam formed by the boiling of the water being " conducted into the buckets on that side of the wheel where " they open downwards, as near the center on the under side as " may be, the water in the floom or box will then act with a force " to turn the wheel, in proportion to the quantity of steam in the " buckets, at the rate of about eight or nine pounds to each

" gallon, which, together with the circular motion of the water, " will give a regular motion to the wheel, which may be com- " municated, either by a crank or otherwise."

[Printed, 6d. Drawing.]

A.D. 1800, March 19.—N° 2382.

JOHNSON, WILLIAM.—" Machine, with new means of obtain- " ing power in mechanical operations, of the nature of a self- " moving power or perpetual motion."

[No Specification enrolled.]

A.D. 1800, August 2.—N° 2431.

MEDHURST, GEORGE.—Æolian engine. The power applied to the machinery is compressed air, which is generally compressed by wind, but sometimes by other means, as by hand, for which purpose a pump is used consisting of two toothed wheels, one of which is turned by hand and turns the other. Each of these is furnished with an axle having a crank, whose connecting rods are attached to the same piston rod. When the air is compressed by a windmill a double pump is used with a variable beam worked by a rod fastened to a crank, on the horizontal axis of the mill. The crank is made triangular, and the connecting rod may by means of collars be placed in any part of it. Means are described for making the piston always wash the bottom of the barrels, altho' the length of the stroke should be ever so much reduced. Carriages are propelled by compressed air if light and on good roads by means of a cylinder, with a circular moving variable piston, or where greater power is required, by means of two cylinders with a compound beam. The engine to charge one magazine to any required degree by another of a less degree of condensation, consists of two cylinders, the piston rod of one working a beam which is connected by a piece to the beam working the piston rod of the other cylinder.

A machine or engine (from the drawing it appears to be a locomotive) to be driven by fixed gunpowder or other explosive or effervescent substance, is also described. It consists of a closed cylinder, having one end much stronger than the other, and furnished with a pipe leading from a funnel containing the explosive substance. A small portion of this is introduced into the

cylinder by turning a plug half round, and is ignited by a flint, agate, or diamond wheel within the piston, which has a pinion working in a rack, whose end strikes against a plate as the piston drives it on, whereby the wheel makes a revolution upon the steel placed above it. The plug which introduces the explosive substance is turned half round in every revolution of the axle tree of the carriage by an arrangement of toothed wheels. The cylinder has a valve at each end. Through one the air escapes after having driven down the piston, and the other serves to keep a supply of atmospheric air which acts as a spring to aid the return of the piston.

[Printed, 1*s.* 2*d.* Drawings. See Rolls Chapel Reports, 6th Report, p. 149.]

A.D. 1800, August 13.—N° 2438.

SUTTON, Robert.—"Sails for a windmill."

The stocks are made to run along the middle of the sails dividing them into two equal parts. In each part is "one vane "of thin deal which turns on pivots at each end in thimble "bosses placed in such situations as that the retreating part of "each vane may comprise the greater quantity of surface, each "at the same time being made to balance upon the pivots from "each vane." The vanes are turned by studs on cross bars moved by means of an iron rod which passes through the centre of the axle of the mill, and may be pushed backwards or forwards by means of a rope and a set of levers within the mill. To put the sails in motion the rod must be pushed forward, by which the vanes will be turned to the "position of the greatest angle of "weather for producing the best possible effect," and are kept in such position by a weight fixed on the rope. If the impulse of the wind be too strong, it will turn the vanes so as to reduce the angle of weather.

[Printed, 8*d.* Drawing.]

A.D. 1801, February 10.—N° 2476.

JOHNSON, William.—"Machine which has the principle of "its motion within itself, denominated the perpetual motion or "mechanical self-moving power."

[No Specification enrolled.]

A.D. 1801, May 21.—N° 2504.

GLAZEBROOK, James.—This consists,—

First, in employing other than atmospheric air, or mixtures of other airs, such as hydrogen, nitrous air, carbonic acid, ammoniac, and azotic airs, to give power to machinery, and if necessary causing the said air or airs to be repeatedly fit for use by passing them through a refrigerator.

Secondly, in exposing as large a surface of fluid as possible to the action of the air after it has been heated.

Thirdly, in separating and preserving the fluid, whether water or other fluids, or mixtures of other fluids used, which is combined with the hot air that is discharged, and supplying the heaters with it.

The engine to which these inventions are applicable consists of a forcing pump to supply the heaters with compressed air, flues or heaters in which the air is heated, a saturator, in which it is combined with the fluid employed, an expansive vessel, in which it acts against a piston, and, if necessary, a refrigeratory composed of metal vessels cooled by a draught of air or water.

[Printed, 1*s*. 2*d*. Drawing.]

A.D. 1810, July 31.—N° 2530.

BROWNE, Mark.—Engine having mobility when immersed in any moving fluid, particularly wind or water. This consists of a frame within which is an upright shaft, at each end of which is fixed a cross. Sails or flies are placed at the extremities of the arms of the crosses, and a current in one direction causes these sails to form angles with the arms, and to turn round the shaft, the sail which is advancing against the current being at right angles to the arm its axis works in. The sails are fixed to the arms by means of staples, of which one prong is drawn through a hole near the point of the arm, and both prongs are then driven into the fly or sail frame (when canvass is used). Eight, twelve, or sixteen sails or flys may be used, but even numbers are recommended, because three-fourths will be always in power, and one-fourth out of power.

[Printed, 6*d*. Drawing.]

A.D. 1801, August 20.—N° 2534.

LUKIN, Lionel, the younger.—"Method of giving power to "machinery by the application of air and water."

[No Specification enrolled.]

A.D. 1801, August 20.—N° 2535.

PARKES, William.—"A perpetual power that will give motion "to all kinds of machinery."

"This grand arcanum or secret of nature is that liquid or fluid "composition called air, not formed by art but by the chymical "process of nature." The method of applying this perpetual power to give motion is by compressing or condensing air into a receiver with an air pump, and conveying it to a wheel with close or open buckets, or to a piston by pipes, valves, or cocks.

"The machine itself will keep the pumps or bellows constantly "at work by fixing a crank to the air pump, by which means it "communicates with the first motion." "This gives perpetual "motion to the machine, which nothing else in nature can do."

[Printed, 4*d*. No Drawings. See Rolls Chapel Reports, 6th Report, 150.]

A.D. 1801, September 18.—N° 2540.

BARRATT, Zachariah.—Corn mill. The cross is placed upon an iron plate on the axis of the mill shaft or the crown wheel. The extremities of the arms of the sails are fastened by screw and moveable iron bandages to the cross which is inserted into slots. Supporting arms are put at mortises on the sail arms, and secured by a peg. The first part of the sail falls into a slot and is kept in its position by pegs and a guard. Two other fan sails slide on each side of the fixed one, moving on a centre at the narrow extremity, and when expanded are kept in their position by pegs in a groove or tubing at the other extremity. These sails are made of thin boards. When the sails are affixed to a gable end whence it will occasionally be necessary to catch the wind at opposite sides of the sail a ledge is attached to each sail arm into the nicks on which falls the spring of the adjoining sail, by which means the sails are turned to opposite degrees of obliquity.

[Printed, 6*d*. Drawing. See Repertory of Arts, vol. 16, p. 79.]

A.D. 1801, October 30.—N° 2546. (* *)

BRAYSHAY, Richard, and McMAHON, William.—1. Vanes or sales are arranged between two wheels on the same shaft. "The "sails or float-boards are so contrived as to be able to play in "a given space, being fixed perpendicularly on the wheel and "fastened by a cord or otherwise, so that when the wind blows "from any quarter three-fourths of the sails catch the wind, and "by forcing the wheel round those sails which are forced against "the wind come up edgeways, but when past the centre imme-"diately receive the breeze, and by that means produce a con-"tinued circular motion."

"This may be better understood by supposing the method "which is taken to make a vessel sail against wind by tacking "about. In some cases where we may judge it necessary we place "two sails together opening as it were a book."

The machine is used to row a boat by causing an upright shaft to turn with "a half circle wheel" upon it (acting apparently like a cam) to move backwards and forwards a frame connected with "the winged oars." These oars are beams with vanes hinged on them on each side, and which open like the leaves of a book when driven against the water and collapse for the return stroke.

2. On the shaft of a windlass or capstan are fixed ratchet wheels. These may be worked by levers carrying palls, so as to turn the shaft when the levers move one way, and to shift the palls over the wheels when the levers go the other way.

3. A windlass which expands or contracts in diameter by the action of two circular plates at each end of the barrel, one with radiating slits through which the bars pass, and the other with spiral grooves in them carrying the ends of the bars forming the barrel.

4. A weighted frame, being inside the vessel, is at liberty to move backwards and forwards according to the motion the vessel gives it, and thus to turn the levers of the windlass, which by cranks on its axis works the winged oars.

5. A frame moveable on a pivot, by which the height of the row-locks used for common oars may be adjusted.

[Printed, 8*d*. Drawings. See Repertory of Arts, vol. 1 (*second series*), p. 11.]

A.D. 1802, January 28.—N° 2577.

BAKER, Thomas Charles.—"Vanes or sails for wind-mills." The sails have a whip or additional arm in the centre with two

cross bars attached, and two rolls "fixed to turn in wears in the "cross bars." The leading edge of the vanes is made fast to the rolls. A rope fixed to the outer corner of the sails is passed over a pulley in the cross bar and thence through a seive in a double block and brought back to a catch near the cross bar. The double block is connected with and can be moved by relieving ropes passing through blocks at the end of the brace pole to the end of the shaft and again connected with a racket wheel on the shaft. By means of this apparatus all the external points of the vanes can be liberated and will then "fall back from the wind." The width of the vanes may be reduced by turning the rolls by means of winch handles.

[Printed, 6d. Drawing.]

A.D. 1804, September 14.—Nº 2782.

BYWATER, John.—"Clothing and unclothing of the sails of "wind mills." This is done by rolling them up to the whip "by "means of cylinders or rollers of any shape as long as the sail "with a toothed wheel at one end of each, working either di- "rectly or indirectly into two wheels without arms, which are "hung so as to turn upon a ring of iron fixed to the shaft head." Either of these wheels may be prevented from turning.

[Printed, 1s. Drawing. See Repertory of Arts, vol. 6 (*second series*), p. 7. Rolls Chapel Reports, 6th Report, p. 202.]

A.D. 1806, October 7.—Nº 2974.

SAMPSON, William.—Windmills. The first part relates to horizontal engines. Two or more opposite arms are fastened transversely to the top of an upright shaft; each arm is turned up at the further end to form a crutch or hollow semicircular socket. A shaft of iron having a fan or sails at each extremity is placed horizontally on the crutches of each pair of opposite arms, and is provided with three stays; the fans or sails at the opposite extremities are in planes perpendicular to each other. Two of the stays are to prevent the axis from moving more than a fourth of a circle in turning on its crutches. This is done by each butting alternately on the transverse arms. The third stay is for the purpose of suspending the action of the shaft. By these means the sail moving with the wind is made to assume a vertical, and *the opposite sail* a horizontal position.

The second part relates to a mode of clothing and unclothing the sails of any windmill by means of small sails fixed on a small shaft contained within the main shaft hollowed out for the purpose. The cloths of the mill sails are fastened to the transverse parts of T-shaped pieces of timber, the shafts of which are worked backwards or forwards by chains or rackets and a wheel on the small shaft. This small shaft is made to revolve with different velocities by a brake regulated by hand or centrifugal balls.

[Printed, 6*d.* Drawing. See Rolls Chapel Reports, 7th Report, p. 194.]

A.D. 1806, October 30.—N° 2982.

PROSSER, JOHN.—Smoke or air jacks. The first improvement is making the box or body to extend the whole length from or near the centre of the chimney to the breast, inclosing the spindle, and terminating at the chain wheel. The second in raising the spindle and chain wheel in a slanting direction above the centre of the worm by which the oil flows above the top carriage of the worm without pipes: the case being made in one piece except the top, which is fastened on to remove at pleasure. The third in making the chain wheel of brass or iron instead of wood, and placing tags or holes in the space in which the chains run to prevent them from slipping. The improved case may be applied to a jack which works both vertically and horizontally, and to single and double jacks. Another case is formed to contain various wheels, pinions, or cranks connected with the first worm wheel and continued any length of time as the situation may require. The body may be nearly two inches wide to twelve deep. The jack in this case, like the others, is moved rather by the air than the smoke. Instead of three bevel gear wheels only one is placed in the middle of the spindle.

[Printed, 6*d.* Drawing. See Repertory of Arts, vol. 11 (*second series*), p. 161; Rolls Chapel Reports, 7th Report, p. 192.]

A.D. 1807, May 9.—N° 3041.

CUBITT, WILLIAM.—"Equalising the motion of the sails of "windmills." The vanes are formed with fewer cross-bars or shrouds than usual, and the remaining open spaces are filled with small flat rectangular surfaces disposed perpendicular to the whip, and suspended on their ends by gudgeons, or in some

other convenient method, so as to open and shut like valves. They may be moved by means of levers, or of pinions working in racks, and are regulated by a weight hung on a sheave inside the mill, which, by a rack and pinion, moves an iron rod passing through the centre of the shaft.

[Printed, 6*d*. Drawing. See Repertory of Arts, vol. 11 (*second series*), p. 81; Smith's Mechanic, vol. 1, p. 257; Rolls Chapel Reports, 7th Report, p. 104.]

A.D. 1808, February 4.—N° 3106.

DUMBELL, John.—Motive power is obtained according to this invention from the explosion produced by introducing small quantities of water on to a mass of molten metal contained in a pan above a furnace. A cylinder with sails or flyers like those of a windmill or smoke jack is fitted to the chimney above the pan. The furnace may be supplied by bellows or fans with oxygen, hydrogen, or carbonated hydrogen gases, or with the damps found in mines. The gases may be kept in balloons or reservoirs and made to pass through stink traps or refrigerators to the furnace. The residuum calx and scoriæ may become valuable. Red lead, sulphuret and phosphuret of lead, glass from the oxides of lead, and plumbers' solder may be thus prepared and other processes carried on. Gunpowder, wax, and oleagenous bodies, phosphorus sulphur, oxymuriate of potass, fulminating powder, fulminating silver and mercury, and many other substances may be used. When the residuum is not a desired object the precious metals offer an intervening body. The sails and flyers may be united and the impelling power admitted into a chamber in which it presses against an obstacle fastened to a wheel which is thus driven round; or it may be made to turn round one or more water wheels immersed in water. A method of applying the power so as to produce a motion to and fro ad libitum, and also of applying it to turn the wheels of a carriage is also described, and part of the Specification relates to a new species of carriage.

[Printed, 1*s*. Drawing. See Rolls Chapel Reports, 7th Report, p. 106.]

A.D. 1808, August 20.—N° 3161.

TILLOCH, Alexander.—"Invented and discovered a new "physico-mechanical power or, in other words, improved ma-

" chinery or apparatus capable of being employed as a moving " power to work or drive machinery and mill work and applicable " to other useful purposes."

[No Specification enrolled.]

A.D. 1809, June 15.—N° 3243.

FESENMEYER, JOHN PHILIP.—" Certain improvements in the " construction and working of steam and atmospheric engines, " by which they may be more advantageously worked than " hitherto."

[No Specification enrolled.]

A.D. 1809, September 4.—N° 3259.

LONG, SAMUEL.—" Horizontal windmills." Each sale is made to revolve on a vertical axis, one of such revolutions being made during two revolutions of the vertical shaft. In order to effect this a ring with its surface formed into bevel teeth is placed to rest on the plate surrounding the collar in which the shaft moves. A bevel wheel with an equal number of teeth is placed at the bottom of the axis of the sail and fastened to it so that they revolve together. The two wheels are connected by a spindle terminated at each end by a bevel nut one of which works in the wheel round the shaft and the other in the wheel of the axis of the sail. The latter has only half as many teeth as the former. The wheel round the shaft is usually stationary but may be set to any position by turning a nut. In this way the sails on either side of the shaft may be brought to a position perpendicular to the direction of the wind while the opposite sails are parallel to that direction, or they may be adjusted according to the strength of the wind.

[Printed, 8d. Drawing. See Rolls Chapel Reports, 7th Report, p. 202.]

A.D. 1809, September 26.—N° 3264.

WATTS, WILLIAM.—Mills. A windmill of great power is formed by two drum wheels, having at each end iron plates in which are cavities at regular distances to receive the axles of the sails. Over the wheels work two chains connecting the axles. The axles are steadied by small wheels at their ends, which run in a channel in the framing of the mill, and upon each axle is a

double frame of which the inner carries the sail. The inclination of the sails to the wind is regulated by springs. The sails are blown round the two wheels, the under sails being sheltered from the wind, and the upper ones receiving it in an angle between each other. The head may travel round to the angle at which the sails act most advantageously.

[Printed, 8*d*. Drawing. See Repertory of Arts, vol. 18 (*second series*), p. 15; Rolls Chapel Reports, 7th Report, p. 110.]

A.D. 1810, May 9.—Nº 3335. (* *)

CHAPMAN, WILLIAM.—"A wheel or wheels to be moved by " water, steam, or any other suitable fluids or gases, and may " be applicable to mechanic or other purposes where a moving " force is required."

This "invention is to be performed and carried into effect by " using a wheel with a grooved channel on its rim or exterior " face closely surrounded by a cylinder, or a wheel with a " cylindric surface, surrounded by a case containing a concentric " grooved channel closed up by the face of the cylinder. In both " instances the surrounding case is stationary, and has two " apertures into the channel, which is of a uniform transverse " section; one of these apertures is for the admission of water, " steam, of gas, and the other for its emission, and between these " apertures there must be attached or affixed to the interior " of the surrounding case, which must be strong enough to resist " its inequality of pressure, a block or stop of any suitable sub- " stance or substances, filling up the channel for a due length, " so as to prevent a communication between the apertures or " holes of admission and emission, excepting in the direction in " which the wheel is to move, by the propelling force of the " motive fluid acting upon, opening, and closing leaves affixed " to that part of the wheel which forms the interior boundary of " the concentric channel. These leaves, when open, must fill up " the channel and continue so until arrived at or past the hole of " emission, when they must begin to close and fall into their " cavities, in which position the back of the leaves will form a " regular portion of the channel, so as to pass under the stop " block which fills up its section. Then, after passing the hole " of admission of the propelling fluid, it again opens to receive " *its* action, and proceeds as before."

" Rarified air or gases, whether extricated by the explosion of " gunpowder, the inflammation of essential oils, or other means, " may be the moving power."

[Printed, 1s. Drawing. See Register of Arts and Sciences, vol. 4, p. 428.]

A.D. 1810, October 1.—N° 3384.

BRUNEL, MARC ISAMBARD. — " Giving motion to ma- " chinery." This is to be done by forcing air by means of a pump or other organ (the screw of Archimedes being preferred) down to a suitable depth in a vessel containing cold water. The air then escapes into an inverted funnel, and thence through a pipe into the lower part of a vessel containing hot water, in which is a bucket wheel of the same kind as those which are called over shot wheels. The air brought into contact with the hot water becomes greatly enlarged, and escaping beneath the buckets of the wheels causes it to revolve. The height of the column of cold water should be greater than that of the hot. Other dense fluids may be used in place of water. And the screw immersed in mercury or other fluid may be used to propel air instead of bellows or as an air pump.

[Printed, 4d. No Drawings. See Rolls Chapel Reports, 8th Report, p. 82.]

A.D. 1811, September 9.—N° 3484.

JONES, JOHN.—" Method or methods of applying the expansive " force or pressure of atmospheric air, condensed air, or steam in " or upon a wheel, so as to be the first mover of machinery."

[No Specification enrolled.]

A.D. 1812, December 19.—N° 3628. (* *)

MORGAN, JOHN. — Obtaining motive-power for propelling vessels and boats of every description through the water, and also for pumping them and performing other mechanical work within the same. One end of a lever has a floating-piece or buoy on the water outside the vessel, and the other is attached to suitable gearing inside. Motion is communicated to the lever by the rising and falling of the waves, or of the vessel.

[Printed, 3d. No Drawings. See Repertory of Arts, vol. 23 (*second series*), p. 298, vol. 6 (*third series*), p. 41; Rolls Chapel Reports, 8th Report, p. 95.]

A.D. 1813, January 15.—N° 3640.

ALLIN, WILLIAM.—"Machinery to be worked by wind." The shaft is vertical, and provided with sails, of which three sorts are described.

In the first, two flaps playing on two or three joints each, and counterbalanced by rods bearing balancing weights, are placed at the ends of each arm. Ropes or iron braces pass from arm to arm, and two or three rods, ropes, or webbing come from each sail through a series of pulleys to the inside of the mill.

The second sort of sail is kept extended by a rod, which moves on a joint, and continues through another joint to the inner end of the sail, and then continues as a balancing weight.

The third sail has a square frame with three or four doors, which shut when they come into the wind, and open when half way round.

[Printed, 6d. No Drawings. See Rolls Chapel Reports, 8th Report, p. 95.]

A.D. 1813, April 13.—N° 3681.

RANGELEY, JOHN.—The principle of the invention includes using water or other non-elastic fluid to produce a vacuum, or remove the pressure of the atmosphere continually from one side of a piston while it is acting on the other. This is done in the engine first described by making each end of the cylinder communicate with a cistern, and with a centrifugal pump worked by the engine. The communications have valves which are alternately opened and shut so as to enable the pump to withdraw water from one side of the piston while atmospheric pressure forces it from the cistern to the other side.

[Printed, 6d. Drawing. See Rolls Chapel Reports, 8th Report, p. 99.]

A.D. 1813, May 5.—N° 3689.

WALKER, THOMAS.—"Horizontal windmill." This consists of an octagonal conical frame or building closed on every side by shutters, which can be opened or shut, and regulated according to the force of the wind by a lever acted on by a weight. Within is a vertical shaft with arms carrying vanes "made of thin boards, " the one standing edge upwards, and the other put on the top, " leaning towards the wind, forming the eighth angle." "When " the windmill is in action, the shutters must be four open and

" four shut, except the wind blows very strongly, then six shut
" and two open."

[Printed, 8*d*. Drawing. See Rolls Chapel Reports, 8th Report, p. 99.]

A.D. 1815, April 25.—N° 3909. (* *)

PAULY, SAMUEL JOHN, and EGG, DURS.—" Certain aerial " conveyances, and vessels to be steered by philosophical or " chemical and mechanical means, and which means are also " applicable to the propelling of vessels through the water and " carriages or other conveyances by land."

The aerostat or balloon has a " form whose farthest extremities " may be in an horizontal and longitudinal direction, or nearly " so, such as the shape of a fish or bird." A frame round the lower part of the aerostat, called "the head frame," holds the net, as well as an appendage capable of acting as a parachute, and the requisite suspensory fastenings of the car. To drive and direct the balloon, "fins, feathers, fans, or wings" are employed; they are made of silk fixed to a staff by whalebone ribs. Five feathers may form a wing, and for that purposes are fixed alongside into a "head piece," which is applied to a steel spring "fastened to " the head frame, playing backwards and forwards horizontally." " Each separate fin, feather, fan, or wing has a threefold power, " which we call *attractive*, aspiring or sucking, *repulsive*, driving " or blowing, and *collective* or united." The tail or rudder is formed of the same materials as the said fins. A moveable weight, consisting of a barrel containing water, is used as ballast for guiding and directing the balloon. The said fins may also be applied to a machine that is capable of raising and supporting itself in the air without the assistance of gas. The impetus to such machine is given by a fly and fly wheel or wheels similar to those applied to windmills.

The principle of constructing the above-described "fins, " feathers, or wings," is declared to be also applicable to the working of windmills.

[Printed, 4*d*. No Drawings. See Repertory of Arts, vol. 31 (*second series*), p. 17; Rolls Chapel Reports, 7th Report, p. 116.]

A.D. 1815, June 22.—N° 3934.

BAINES, ROBERT BAINES.—" Vertical windmill sails." These are fastened to the front sides of the arms and extended by rods

along the free edges of the sail and by a rod placed diagonally. The rod at the end furthest from the shaft is jointed to a rod placed along the arm in a manner which permits the sail to move away from the wind when it blows against the back side. These rods may also be adjusted and the sails made to recede from or approach the wind by means of a regulating weight. The exterior free corner of each sail is connected by a rod with the interior free corner of the sail immediately succeeding.

[Printed, 6*d*. Drawing. See Repertory of Arts, vol. 30 (*second series*), p. 198.]

A.D. 1816, January 9.—N° 3973.

REYNOLDS, Joseph.—" Construction of wheel carriages and " of ploughs and other instruments used in husbandry, to be " moved by steam, heated air, or vapour." The construction of wheel carriages to be used on ordinary roads is described at length. In producing the steam or the formation of the steam engine, no invention is claimed further than the mode of suspending the boiler and constructing the joints of the pipes or tubes which communicate therewith, so that the boiler may in all movements retain a horizontal position. This is done by attaching it to a transverse axis which may be hollow and form a communication between the boiler and the steam pipes by means of a stuffing box or stuffing boxes which admit the end of the axis to turn in the steam pipes, or the axis may embrace the pipes and move round upon them, or the axis and pipes may be united by any means by which a shaft or spindle is made to turn round easily but without leakage in or through the side of a nozzle or pipe containing steam, heated air, or vapour. A stop cock or throttle cock is placed in the axis to regulate the quantity of air, steam, or vapour, and similar joints are made in the steam pipes before they unite with the cylinder or with the nozzles, steam boxes, or cocks, they may unite with.

[Printed, 1*s*. Drawing. See Rolls Chapel Reports, 8th Report, p. 115.]

A.D. 1816, March 14.—N° 3995.

MONTGOLFIER, Pierre Francois, and DAYME, Louis Henry Daniel.—This consists of a machine for raising water by means of heated air. Two chambers, one considerably above the other and a pipe up which the water is to be forced, are

arranged in a triangle around the furnace. The upper called the air chamber communicates with a cylinder from which measured quantities of air may be introduced. It also communicates with the furnace by a tube having a valve which allows air to pass to the fire but is shut by a float when the water rises up to it. The lower or water chamber communicates with the external air by an opening with a similar valve and also with the furnace and the well. Valves prevent either air or water passing back to the furnace or the well. The chambers and ascending pipe are all united together by a curved tube of three branches. At the commencement of a stroke the pipe and water chamber are filled with water but the air chamber with air. The water descending down the pipe forces the air from this chamber into the furnace. The fire then burns freely and the heated and expanded air forces its way into the water chamber and forces the contained water up the pipe with considerable velocity. This motion will continue "by "what is called vis inertia" after the pressure has diminished, and will presently be communicated to the water in the air chamber, thus allowing fresh air to enter. And water from the well will at the same time enter the water chamber. After the motion is expended the water descends again down the pipe, drives the air out of the water chamber and repeats the stroke. Every stroke part of the water passes out from the top of the pipe into a cistern and this part alone is permanently elevated. A second machine on the same principles is described in which the air chamber is placed immediately over the water chamber, the separation between the two being made by valves which allow air and water to pass only into the upper chamber while there is a free passage through tubes for water to pass down from the upper chamber. When the machine is applied for turning mills or other machines the water which it elevates must be made to fall on a water wheel or other machine.

[Printed, 10*d*. Drawing. See Rolls Chapel Reports, 8th Report, p. 113; Repertory of Arts, vol. 32 (*second series*), p. 257.]

A.D. 1816, March 14.—N° 3996.

DAWSON, James.—This consists in forming paddles for propelling vessels of elastic and flexible materials. Rods of wood, whalebone, or other material capable of acquiring due elasticity are made in one or more pieces or leaves and connected and covered with flexible or slightly elastic substances such as cloth,

leather, or canvass, saturated with a solution of caoutchou. By strengthening the rods or elastic planes on one side an oblique elastic action is obtained. The centre rods are usually made weaker than the outer ones, and the several rods may be socketed so as to turn a little both ways. Such sails are adapted to horizontal and vertical windmills. In some cases elastic levers or masts are made use of; one of them is left strong and the other tapered down and made flexible. To this one or more elastic planes may be attached. The form may be varied but the invention consists mainly in adopting the principles of elasticity and flexibility to obtaining an action on fluids in the manner exemplified by the tails and fins of fishes, and the elastic paddles, planes, and oars may be applied to windmills and other purposes.

[Printed, 6*d*. Drawing. See Rolls Chapel Report, 8th Report, p. 113.]

A.D. 1816, August 14.—Nº 4058. (* *)

NEVILLE, James.—"Generating and creating or applying "power by means of steam or other fluids, elastic or non-elastic, "for driving or working all kinds of machinery."

1. Utilizing "the expansive properties of steam or other elastic "fluids to a greater extent than hitherto practised instead of "condensing or allowing them to escape whilst they still retain "any useful degree of power." This is effected in the case of steam by causing it to ascend through denser fluids, that may be raised to a higher temperature than steam without being converted into vapour. A cylinder closed at both ends communicates with a boiler and condenser. A second cylinder, with buckets on its circumference similar to those of an overshot water wheel, moves freely on its axle within the stationary cylinder. The space between the cylinder is filled in part with quicksilver. This dense fluid being heated above the temperature of the steam and the condenser vacuated, the steam admitted beneath one of the lower buckets ascends, displaces the quicksilver it contains, and raising its altitude fills the next higher bucket and so on, continually increasing the preponderance to a certain limit causes a rotary motion in the bucket wheel.

2. Elliptical rotary engine. Two oblong pipes connected by semicircular ends, have an axle in the centre of each semicircle, which carries two pulley wheels or a drum, having a notched or toothed periphery. On these drums a double endless chain is

wound, which catches into the notches on their peripheries. To each joint of the chain a bucket is attached which ascends in the pipe with its mouth downward, and descends in the opposite pipe with its mouth upward, in the manner of a chain pump; a small pipe open at both ends placed in each bucket permits the rise of surplus steam or other elastic fluid into the bucket above. The case enclosing the buckets is filled with a dense and non-elastic fluid quicksilver of a higher temperature than that of the steam; the steam admitted at the bottom of the lower semicircle into a bucket displaces the mercury and raises it into the bucket over, and continues to do so with each bucket in its ascent until it escapes at the upper semicircle into the air or into a condenser, giving preponderance to one column of buckets, and producing a rotular movement of the endless chain which is communicated to the drum axles.

3. Steam is caused to pass through mediums of much higher temperature than its own to raise its heat without augmenting its elasticity, or rendering it dangerous. A cast-iron cylinder is set upon a vessel containing a quantity of oil, heated by a stove beneath it. Another cylinder closed at its upper end, and attached to a chain wound over a pulley and balanced with a weight at its other end, rises and falls (steam-tight) within the outer cylinder like the receiver of a gasometer. The steam pipe from the boiler passes through the fire-place and through the heated oil vessel into the "expanding receiver," and is thence re-conducted according to the drawing through the oil vessel into the working cylinder. By this contrivance one measure of steam may be augmented 20 or 30 times in volume, without materially increasing its original elasticity.

4. A considerable quantity of sensible heat, absorbed in a latent state by expanding steam, may be separated by a "gradual caloric "abstractor," composed of 6 cast-iron cylinders each 4 feet in length, and of 12, 11, 10, 9, 8, 6 inches internal diameter respectively, containing 29, 23, 19, 16, 13, 9 tubes an inch in bore, open at each end, passing steam tight through circular plates which form the ends of the enclosing cylinders. Curved pipes unite the top and bottom of each two cylinders, which are filled with a fluid of lower temperature than the steam, that in its passage to the condenser gives out some of its heat to the cooler fluid they are surrounded with, the current of which flows in a contrary direction to that of the steam. The common safety and regula-

ting valves are placed on the engine, and the boiler, gradual caloric abstractor, and rarifier may be surrounded with any material that transmits heat slowly.

5. An apparatus in which the rarifier and gradual caloric abstractor are connected to an elliptical rotary engine.

6. A method of heating the water in a common steam boiler and also the oil or quicksilver in the engine.

[Printed, 1*s.* 2*d.* Drawings.]

A.D. 1819, May 1.—N° 4364.

COPLAND, Robert.—Motive power is obtained from the pressure of the atmosphere through the medium of a column of water or other liquid descending on one side of an inclosed vertical wheel, which is provided at regular intervals with float boards fixed either immoveably to the rim or by moveable joints which allow the floats to open out parallel to the radii. The water thence passes through a centrifugal wheel, kept in constant rotation by the action of the engine when at work, and is discharged through apertures into the reservoir, whence the atmospheric pressure raises it again to be delivered on the top of the vertical wheel. A closed pipe leads from the case of the vertical wheel to a hollow waterway round the rim of the centrifugal wheel. The whole machine must be air-tight, and every part filled with water before being put to work. The centrifugal wheel is then set in motion by an assisting force.

[Printed, 1*s.* Drawing. See Rolls Chapel Report, 8th Report, p. 134.]

A.D. 1819, November 1.—N° 4405. (* *)

GUNDRY, Israel, NEAVE, Edward, and NEAVE, Josiah. —"An application of various gases or vapours to certain useful "purposes."

This invention consists, first, "in the working of a piston or "pistons in a barrel or barrels by means of factitious gases, "either pure or mixed with vapours of various kinds, and by "which a mechanical first mover or power is produced capable of "driving wheels or other machinery."

"Second, in the forcing of water or any other liquid by means "of such gasses pressing thereon by their elastic power."

The use of gas derived from the distillation of coal or oil in closed vessels is preferred for the above purposes. The gas being

generated under pressure may be caused to move an engine after the manner of a steam engine; or its expansive power may be employed to displace and elevate water from a vessel to a higher level. Gas so employed may be caused to pass into a gasometer to be subsequently used for the purpose of illumination, &c.

[Printed, 1*s*. Drawing. See Repertory of Arts, vol. 37 (*second series*), p. 129; London Journal (*Newton's*), vol. 1, p. 175.]

A.D. 1819, November 23.—N° 4413.

LILLEY GEORGE.—In an engine wrought by the agency of atmospheric air, a reservoir placed in or over a furnace is enclosed in a strong case, between which and the reservoir some non-elastic fluid (such as metals which will remain fluid under the temperature) is interposed. This space is connected with an air box, which by a syringe is filled with air at a pressure equal or superior to that in the reservoir. The box must be of sufficient capacity to allow of the rising and falling of the fluid produced by the unequal expansion of the cases between which it is contained. Several cases may be used, each space being distinct and connected with a distinct air box, the pressures in which decrease in regular proportions. Cold air is compressed by an air pump surrounded by cold water or air and supplied to the reservoir, whence it passes to the motive cylinder. This cylinder has an outer case, between which and the cylinder the smoke and hot air of the furnace circulates. There are also spaces for the elastic fluid to circulate in before passing inside the cylinder. The valves are in the form of a revolving double pipe, with four orifices in the outer pipe and two in the inner pipe, which is cast or brazed to the outer one around these orifices. The induction and also the eduction orifices are made on opposite sides of the pipes for the upper and lower parts of the cylinder. The piston is made in two parts, bolted together so as to admit of a small quantity of fluid (liquid metal, wax, animal fat, or any other that will not change to vapour) between them. The upper plate is formed with a rim, reaching nearly to the bottom, with a space between the rim and the inside of the cylinder for the fluid. There are communications on the upper and lower plates with the interior of the cylinder, but the fluid is prevented from passing either way except in very small quantities by thin metallic rings fitting into grooves. An opening in the top plate, closed by a clack, permits the piston

being replenished with fluid each time it arrives at the top of the cylinder.

[Printed, 10*d.* Drawing. See Repertory of Arts, vol. 39 (*second series*), p. 65; London Journal (*Newton's*), vol. 1, p. 324.]

A.D. 1820, December 9.—N° 4516. (* *)

MOORE, John, the younger.—Rotary engine to be worked by steam, water, or gas. A drum or cylinder has four or more cavities in its circumference to receive the same number of valves turning on hinges or pivots, so as to shut down into recesses or to turn upon their pivots in the direction of radii projecting beyond the circumference. This drum with its attached propellers is surrounded by a hollow casing larger than the drum, so as to form an annular space between, equal to the height and depth of the propellers, which fill up the transverse section of the channel and move freely round it. The steam channel is interrupted at two opposite points in its circuit by steam stops or abutment valves, which occupy its width and height, and are fixed to the outer casing, with their inner surface in steam-tight sliding contact with the convex circumference of the drum. These two steam stops and the propellers form four chambers, two of which are always open to the boiler, and two to the condenser or atmosphere. Four propellers are chosen, never less than that number, that the opposite one may be in the same state of action. If more than four be used eight is to be preferred; no other intermediate number will place the opposite propeller in the same state of action.

The elastic vapour is introduced between a reaction valve and a propeller, which is urged towards the condenser orifice and produces a rotary motion. The valve gear and pumps are worked by apparatus carried on the prolonged axle of the drum, and in their rotation the propellers are returned without sharpness into their grooves by means of an inclined or rounded piece of metal fixed on their backs coming in contact with the steam stop.

In another construction of the drum, instead of the propellers turning on pivots or hinges, they are made, by means of steel springs pressing on their end (as sliders), to approach the centre of the drum in a direction perpendicular to its surface, and to recede within its circumference into recesses by the springs yielding, and the inclined plane acting on the curved back of the piston.

[Printed, 10*d.* Drawings. See Repertory of Arts, vol. 40 (*second series*), p. 193. London Journal (*Newton's*), vol. 3, p. 169. Stuart's History of the *Steam Engine*, p 196.]

A.D. 1821, November 14.—N° 4615.

ARNOTT, NEIL.—The first part of this invention is for a method of destroying smoke "by introducing fuel into my fire-"place through a number of metallic channels or troughs, "against the inner mouths or openings of which the burning "fuel lies, and between which as between the bars of a grate "there are interstices for the passage of fresh air. The smoke "given out from the advancing fresh fuel is thus made to pass "through the ignited fuel, and while it is thus intensely heated "it is at the same time intimately mingled with the fresh air "entering between the troughs, and is totally or almost totally "consumed."

In air engines the fire burns in a large but close vessel of iron.

The second part of the invention consists of an air engine to which air may be introduced by a blowing cylinder in the form of an inverted syphon. One arm contains the working piston, and has a top with two valves, one for the admission, and one for the escape of air. The other arm has similar valves. The lower part of the cylinder may be filled with air or water. The air is forced into a tube to which a regulating cylinder is attached, and which leads to the ash-pit. The working piston is placed in a cylinder, the lower part of which communicates with a second cylinder partly filled with water. The spaces above the piston and water respectively are made to communicate alternately with a tube conducting the heated condensed air from the furnace and with the chimney. In order to supply the waste of water by evaporation a pipe leads from the cylinder to a reservoir. The pipe is furnished with valves opened by means of floats in the cylinder when the quantity of water becomes too small. The invention also consists of improvements in brewing and evaporating and distilling fluids.

[Printed, 1s. Drawing. See London Journal (*Newton's*), vol. 5, p. 225.]

A.D. 1821, December 22.—N° 4632.

LINTON, GEORGE.—Motive power is obtained from a vertical wheel furnished with a number of rods made in pieces with ruler joints and jointed on to the wheel, so that the rods by mere revolution of the wheel extend themselves to their full length when they arrive at the upper part of the lower quadrant

of the descending side. At this part a ball rolls along them to a bucket at the extremity. The rods cease to act as levers as they ascend, and are carried up in an inactive state, and discharge the weight or ball when it arrives at a point above the level of the axis, where it rolls by its own gravity to the other end of an inclined plane, and is ready again to be taken into a bucket.

[Printed, 1*s*. 2*d*. Drawings. See London Journal (*Newton's*), vol. 5, pp. 72 and 148.]

A.D. 1823, January 16.—N° 4749.

COPLAND, Robert.—Gaining power, partly improvements on a patent already obtained. The apparatus consists of two series, each of four cylinders. The outer cylinders have pistons attached to the ends of a beam. The inner cylinders have weights or vessels attached by rods to the same beam, and a communication by a passage from the bottom of one to the other, which may be closed by a valve. The outer cylinders in each set communicate with the inner cylinders of the other set, so that air from below the piston is forced into the inner cylinder at a time when the weight or vessel is at the highest, and returns to the outer cylinder when the weight or vessel descends, and the piston ascends.

The weights or vessels thus ascend in water and descend in air. If vessels are used they may be filled with water in their highest position, and discharged when they begin to ascend. The elastic force of the air in the outer cylinder may aid the ascent of the piston. These cylinders above the piston are open and communicate with each other by an open trough, by which water passes from one to the other. The bottoms of the four inner cylinders instead of communicating in pairs may be open and immersed in an open reservoir, and must then be filled with water at first by an air pump or otherwise. These parts are improvements of the feeding pipes of the former Patent.

[Printed, 10*d*. Drawing. See London Journal (*Newton's*), vol. 9, p. 78.]

A.D. 1823, May 27.—N° 4793. (* *)

PEEL, Thomas.—Rotary engine. From a common steam boiler a pipe, furnished with a steam cock, is carried to a hollow cylinder or pipe, that revolves in a stuffing box, and forms an axle, from which four pipes radiate, forming spokes, as it were, to a large fly

wheel. "Steam, or other gaseous media" from the boiler, turned into the hollow shaft, rushes into the spokes, and in making its escape at an orifice, regulated by a slide in the side, at the outer end of each spoke, gives a rotary motion to the hollow shaft, and to a cog-wheel framed on it, from which the movement is transmitted to other machinery.

[Printed, 6d. Drawing. See London Journal (*Newton's*), vol. 8, p. 7.]

A.D. 1823, December 4.—N° 4874.

BROWN, SAMUEL.—Effecting a vacuum, and thus producing powers. This is done by the combustion of gas in cylinders. The vacuum is applied first to turning a water wheel. In this engine are two outer cylinders with moveable tops, attached to the ends of a beam. Within these cylinders are two inner cylinders open at the top. A space is left between the sides of the outer and of the inner cylinders, which last are not so high as the first. The outer cylinders communicate by pipes with two lower cylinders filled with water; gas is introduced into one of the inner cylinders, and is ignited by an external burner. The exuberant rarified air is expelled through a valve in the cover, and a vacuum being produced the water rises into the outer cylinder and flows over the side of the inner cylinder. Air is then admitted into these cylinders and the water passes through a valve into a trough above the water wheel, and thence falling on it turns it round. In the lower cylinders are floats fixed to the beam by rods. As the water descends one end of the beam is drawn down, so as to bring the cover upon that cylinder, which is next to be brought into operation. The rods also are furnished with proper means to cut off the flame of the external burner, and to open the tubes, which introduce air into the inner cylinder at the proper time. The quantity of gas which enters the cylinder is regulated by making it pass through a pipe partly filled with mercury, and which is given an oscillating movement by the rods of the floats. The mercury flows to the lower part, and when there, by its weight, causes a stud to strike against an arm, and thus to turn the cock, shutting off the gas. The vacuum may also be applied to raising water by removing the water wheel, or may be applied to working pistons. In this case the lower cylinders and floats are replaced by a forcing pump having its suction pipes in water, and pistons in the place of the covers are

attached to the ends of the lever, and work in the inner cylinders. When at the highest point a valve in the piston is pressed close by a bar, but is separated during the descent by a spring, and thus allows the water which has been forced up the outer cylinder to escape through a tube in the inner cylinder. The pistons have also light valves for the escape of the rarified air.

[Printed, 1*s*. 8*d*. Drawings. See Repertory of Arts, vol. 45 (*second series*), p. 321, also vol. 1 (*third series*), p. 102; London Journal (*Newton's*), vol. 8, p. 57; Mechanics' Magazine, vol. 2, pp. 360 and 386; vol. 3, pp. 6, 31, 136, 163, and 410; vol. 4, pp. 19, 167, 309; vol. 5, p. 144; vol. 7, p. 82; vol. 9, p. 278; vol. 17, pp. 274, 300, and 326; and vol. 18, p. 53. Register of Arts and Sciences, vol. 1, p. 338; vol. 2, pp. 3, 22, 219, and 260; and vol. 4, pp. 201 and 202. Engineers' and Mechanics' Encyclopædia, vol. 1, p. 612.]

A.D. 1825, February 1.—N° 5087.

THIN, John.—Roasting jack in which the wheel exposed to the current of heated air and smoke revolves in a vertical direction. The vanes are of iron or other suitable metal, and are supported by arms at right angles to the axle. A case or box of cast iron is made to cover a portion of the wheel. Two sides are flat and one curved to a segment of two thirds of a circle. The fourth side is open with a flange round it. The open side is attached by strong hinges in its flange at one extremity of the curved side, and by a chain and pulley at the other, to a frame of cast iron built into the front wall. In order to afford the means of contracting or enlarging the channel for the heated air, the frame is gradually enlarged on both sides from a point up the sides about a foot from the lower extremity till it extends backwards into the middle of the vent, its head being shaped to fit a double curved metal flap which can by a sliding bar be drawn close to the frame or pushed to the back of the vent.

[Printed, 8*d*. Drawing. See London Journal (*Newton's*), vol. 13, p. 84; Register of Arts and Sciences, vol. 4, p. 454; Rolls Chapel Reports, 7th Report, p. 125.]

A.D. 1825, March 15.—N° 5128.

GRISENTHWAITE, William.—"Air engines." A plate of metal perforated with holes, and having over it a quantity of some incombustible substance, is placed above the flue of a furnace where it serves to accumulate the heat and also to stop the dust from the furnace from entering the pipe passing to a cylinder similar to a condensing cylinder of a steam engine. The hot air *enters the pipe* and is admitted to one end of the cylinder hile

cold water is injected into the opposite end. The condensed air and water from the lower part of the cylinder escapes by a pipe furnished with a valve, and that in the upper part of the cylinder is collected in the piston whose upper surface is made into an inverted truncated cone, and passes down through the hollow piston rod and escapes by a valve.

[Printed, 4d. No Drawings. See London Journal (*Newton's*), vol. 10, p. 255.]

A.D. 1825, April 13.—N° 5150. (* *)

GILMAN, William, and SOWERBY, James William.—"Improvements in generating steam, and on engines to be worked "by steam or other elastic fluids."

No mention is made however in the Specification of any other fluid than steam.

Two or more cylindric boilers are placed horizontally over the fire-place of the furnace. Within the boilers are axles, running their whole length, which have leaves or paddles attached to them. These axles or "agitators" are connected together by a cross shaft and bevel gear, which are driven by the engine, and revolve within the cylindric boilers with sufficient velocity to give motion to the injected water, so as to spread it into an extremely thin sheet over the highly heated internal surface of the boiler.

The agitators may be used with concentric cylinders of thin copper, perforated with numerous minute holes fixed on their arms, which revolving within the cylinders, spread the water on their internal heated surface; the evolved steam flows through the small holes into the interior of the copper cylinder, whence it is led to the working cylinder, without the inconvenience of boiling water rising with the steam into the eduction pipe.

By inclining the cylinders, and injecting water from the higher end, the water may be "worked through by its own gravity, and "spread" without the paddles being set obliquely.

The boiler may be used without the agitators.

The furnace has its two sides lined with tubing, and four tiers of tubing, each floored with fire-clay, and with a flue space between each, are set over the cylindrical boilers. Cold water is injected into the pipe at one end of this system of continuous tubing, and flowing through the side lengths, and thence through the tiered tubing, the heated water falls into a cistern, from which it is injected by the "transfer pump" into the agitators.

The effect of the fuel is increased by mixing it with pitch, tar, or similar bodies.

High pressure steam is used expansively in an engine having two or more cylinders, the area of each succeeding cylinder being apportioned to the diminishing power of the steam, which after acting in the first cylinder passes into the second, against the piston of which it acts expansively, the first cylinder having become as it were a steam chamber to the second.

A forcing pump may be attached to boilers, steam pipes, or any chambers connected therewith, for frequently proving their strength.

[Printed, 8*d*. Drawing. See Repertory of Arts (*third series*), vol. 1, p. 369; London Journal (*Newton's*), vol. 13, p. 20; Mechanics' Magazine, vol. 8, p. 1; also vol. 12, pp. 257, 285, 323, 349, 412, 430, 474; vol. 13, pp. 26, 37, 55, 76, 89, 103, 117, 132; vol. 17, p. 300.

A.D. 1825, June 18.—N° 5191.

JORDAN, Edward.—Motive power is obtained by forcing down to any convenient depth under water or other fluid buoyant vessels which are then conducted further from the fulcrum of a beam to which they are connected, so as to act on parts forming in effect a lengthened portion of the lever that depressed them. In the engines described are two cisterns, each with five buoyant vessels which act alternately on rods or frames attached to the ends of a beam, and are made by guides fixed to the sides of the cistern to move to the positions where they can most conveniently raise or be depressed by the rods.

[Printed, 1*s*. Drawings. See London Journal (*Newton's*), vol. 11, p. 70.]

A.D. 1825, July 16.—N° 5212.

BRUNEL, Marc Isambard.—This consists in obtaining power from liquid carbonic acid or other condensable gas. The liquid gas is forced into two cylindrical receivers, each of which communicates with an expansion vessel lined with wood or other nonconductor of heat. The two expansion vessels communicate with the opposite ends of a working cylinder, and contain oil or other suitable fluid as a medium between the gas and the piston. The receivers are traversed by or contain one or more tubes or thin metal vessels. Hot water or steam or any heating medium, and cold water or any cooling medium are introduced alternately into these tubes, and the differences of pressure so obtained will serve to drive the piston. If hot water be in the tubes of one

condenser, and cold water in those of the other, the liquid in the first will operate with a force of about 90 atmospheres, while that in the other will only exert a force of from 40 to 50 atmospheres.

[Printed, 10*d*. Drawing. See Repertory of Arts, vol. 2 (*third series*), p. 157; London Journal (*Newton's*), vol. 12, p. 1; Mechanic's Magazine, vol. 5, pp. 298 and 409, 247 and 257; Engineers' and Mechanic's Encyclopædia, vol. 1, p. 610.]

A.D. 1825, July 30.—N° 5228.

LEAN, Joel.—The first part of the invention is for effecting an alternating motion between bodies revolving about a common centre, so that they are made to approach each other and again to recede. This is done by two elliptical wheels acting on each other at their peripheries by teeth or otherwise, and revolving about their similar foci. If one wheel revolves uniformly, the velocity of the other wheel will vary according as the distance of the point of contact from the axis is greater or less. Circular wheels are made to revolve about the foci as centres with constant velocity, so that a radius of the ellipse whose velocity varies, which was originally coincident with a radius of the circle, will recede from and afterwards again approach it. The effect will be doubled if similar ellipses lying in the opposite direction are substituted for the circles. Vanes are fixed on one wheel and a wheel with sectors on the other, and the vanes and sectors are enclosed in a cylinder which they are made to fit steam tight. By causing the wheels to revolve the contents of the cylinder may be caused to be discharged twice in each revolution. On the other hand if there be introduced into the cylinder water, steam, or other fluid tending by its pressure or expansive force to separate the vanes and sectors, a continued rotatory motion of the wheels may be effected.

[Printed, 6*d*. Drawing. See Repertory of Arts, vol. 4 (*third series*), p. 182; London Journal (*Newton's*), vol. 14, p. 86.]

A.D. 1825, September 15.—N° 5250.

JEFFERIES, William.—"Machine for impelling power without "the aid of fire, water, or air."

[No Specification enrolled.]

A.D. 1825, October 13.—N° 5262.

HOWARD, Thomas.—Vapour engine. Two cylinders communicate with each other by a free passage. One is open at the

top and provided with a piston, below which fixed oil, mercury, or other fluid, not evaporating with the heat used, is introduced in sufficient quantity to fill the base of one cylinder, the passage, and nearly the whole of the other cylinder. On the fluid a smooth plate floats in the closed vapour cylinder. Argand lamps are used to heat the cylinders. A small quantity of ether, alcohol, essential oil or other fluid which evaporates at a lower temperature than water is by a small forcing pump thrown quickly on the floating plate and is converted there into vapour of which the pressure forces down the plate and fluid and makes the piston rise against the pressure of the air. The vapour afterwards escapes through a orifice having a valve usually shut by a spring but opened by the action of a rod detached from the valve. The vapour passes to the condenser where it is condensed either by being received into tubes of which the exteriors are cooled by wet flannel subjected to a stream of air or by injection of a portion of the same fluid as that used to produce the vapour. Instead of working the piston against the atmosphere two closed cylinders each with a piston against which the fluid is thrown or a double acting cylinder and piston may be used without the intervention of oil or other medium.

[Printed, 1*s*. Drawings. See Repertory of Arts, vol. 4 (*third series*), p. 65; London Journal (*Newton's*), vol. 14, p. 181; Register of Arts and Sciences, vol. 4, pp. 65 and 405; Engineers' and Mechanics' Encyclopædia, vol. 1, p. 74.]

A.D. 1826, April 25.—N° 5350.

BROWN, SAMUEL. — Improvements in his former Patent No. 4874. The first of these is mixing the inflammable gas or vapours of alcohol, spirits, essential oils, naphtha, or other articles with common air, by which a much more perfect vacuum is produced. Care must be taken not to add so much common air to the gas before it enters the cylinders as to produce an explosive compound. If cool gas is used rather more than half its bulk of air may be added. In the machine for raising water to turn a wheel the upper cylinders are made single instead of double and are placed side by side. They are each provided with a suction pipe with a valve proceeding from the bottom to the water to be raised. The gas is introduced through a sýphon-shaped pipe from the gasometer. The lower cylinders are no longer used and the moveable lids and valves for admitting and igniting the gas and

air are worked either by a small separate water wheel or directly by the large wheel. The lids work between guides and shut upon a packing formed of Hancock's patent caoutchouc (Nos. 5120 and 5121, Old Law).

In the machine working with piston cylinders a three-throw crank is used and piston cylinders similar to those of double acting steam engines are made to hang to pivots, gimbals, or trunnions. There are three gas cylinders with moveable lids, the lids and valves of which are moved on the same principles as those of the first engine. A small reservoir of water is connected with the engine, and water from it is forced by atmospheric pressure into the cylinders through rose head holes so small that the quantity of water bears no proportion to the size of the cylinder. The water is afterwards discharged through short pipes which dip into the reservoir and have valves to prevent the entrance of water. The vacuum is formed in the gas cylinders by igniting the gas which must be cut off at the moment the covers fall.

[Printed, 1*s*. 6*d*. Drawings. See Repertory of Arts, vol. 5 (*third series*), p. 366, also vol. 6 (*third series*), p. 301; London Journal (*Newton's*), vol. 14, p. 349; Mechanics' Magazine, vol. 17, pp. 300, 315, 326, 366, also vol. 18, p. 53; Engineers' and Mechanics' Encyclopædia, vol. 2, p. 479.]

A.D. 1826, June 6.—N° 5375.

MEIKELAM, Robert.—The engine described in this specification has a cylinder with a piston which is made hollow and communicates with the cylinders by four valves opening on the upper and under sides, two being outlet and two inlet valves. The piston is made in two chambers. Heated fluid from the boiler is introduced to the piston through its rod and passes into one chamber where a vapour is produced which escapes into the cylinder and acts on the piston. The heated fluid afterwards returns by another pipe opening in the piston to the boiler. The fluid may be linseed oil or any other of which the temperature may be raised to the required degree or any semi-fluid metal. The combustion of inflammable gas may be applied to produce vapour in the apparatus by heating its interior and exterior surfaces. A mixture of air and gas is made to fill the piston and is then ignited and a jet of water introduced through the pipe in the rod. A condensing or a high-pressure engine may be thus formed.

[Printed, 4*d*. No Drawings. See London Journal (Newton's), vol. 14, p. 29.]

A.D. 1826, August 1.—N° 5398. (* *)

DE ROSEN, ADOLPHE EUGENE.—(*A communication from John Ericsson.*)—"Motive power engine." The furnace has a limekiln shape; a "worm or spiral pipe" is carried round its interior sides, the upper end of which opens into the furnace, and the lower end out of the furnace into a pipe or passage. The fuel is fed from a hopper at top which has two doors, the lower a sliding one; when the fuel is placed in the space between them, and the upper door shut down, the sliding door is drawn out, and the coals that lie on it fall into the cavity surrounded by the worm, and on the fire-grate at the bottom of the furnace. A pipe from an "air cylinder" opens under the fire-grate and supplies air to promote the combustion, and the gases and air rising from and through the fuel, enter the upper orifice of the worm, and descend in it till it reaches the lower orifice; by which time all the carbon and other matter carried into the pipe are consumed, and the gases escaping are in a sufficiently rarefied and expansive state to act upon an ordinary piston in a cylinder or else to be conducted "into a boiler to generate steam, or encrease the temperature of "steam otherways generated."

A boiler is fitted with shelves or shoots; water poured on to the upper shelf (by a pump which feeds the boiler from a reservoir placed above the furnace) flows downward from shelf to shelf till it reaches the bottom shelf, by which time the whole is converted into steam. Heated air and gases from the furnace are let in upon the various surfaces of water contained in the boiler, thereby generating steam from the water, and the steam is allowed to enter under and move a piston.

[Printed, 5*d*. Drawings. See Repertory of Arts (*third series*), vol. 4, p. 246; London Journal, vol. 1 (*Newton's, second series*), p. 156.]

A.D. 1826, August 12.—N° 5402.

HAZARD, ERSKINE.—(*Partly a communication.*)—This invention is a machine for preparing mixtures of vapours with air and exploding them to obtain motive power. The vapours are prepared from alcohol, spirits of turpentine, or other inflamabl materials, and are mixed in a metallic vessel or tubes so constructed that a stream of air may pass with the vapour through a considerable space interrupted by short turns or other impediments. A box with partitions is described as convenient for this

purpose. The mixture is conducted to a cylinder with a working piston on to the lower end of which a valve consisting of a cylinder of leather is tied. The lower end of the leather cylinder is flattened, and its sides are brought together and kept so by slight springs. A plate of metal prevents the valve being pushed into the cylinder. A piston of thin perforated metal plate is introduced below the working piston and is made to accompany it during part of its stroke, but is afterwards prevented from rising higher by its rod striking a stationary point. The space between the pistons is filled with the explosive mixture and that below the second piston with air during the ascent of the working piston. The inflaming valves then open and shut and a flame is drawn in and explodes the mixture. The contents of the cylinder are driven out through the perforated plate and leather valve. The steam is condensed by keeping the cylinder cool by a water jacket and by injecting water. The vacuum under the working piston causes it to descend and thus works the crank shaft.

[Printed, 8*d*. Drawing. See London Journal (*Newton's*), vol. 13, p. 1.]

A.D. 1827, January 15.—N° 5448.

HALL, William Wilmot.—(*A communication.*)—This consists of an engine having a pneumatic pump, the spaces above and below the piston of which both communicate with the flue and the cistern or boiler. The engine is first set in motion by steam, and the piston of the pneumatic pump is moved by the engine and forces heated elastic fluids from the chimney into the boiler above the level of the water. The mixed steam and elastic fluids are then supplied to the working cylinder. In one arrangement the furnace is supplied with coal by a hopper, in which is a piston that receives a jerk which elevates it two or three inches at every revolution of the balance wheel. The piston may be loaded or descend by the weight of the coal. As it is raised it shakes out a quantity of coal through lateral holes at the bottom of the hopper on to the fire. An iron net is placed over the hopper to exclude large masses of coal.

[Printed, 6*d*. Drawing. See Repertory of Arts, vol. 7 (*third series*), p. 67; London Journal (*Newton's*), vol. 2 (*second series*), p. 59.]

A.D. 1827, January 16.—N° 5452.

COPLAND, Robert.—" Certain improvements upon a patent

" already obtained by him for combinations of apparatus for " gaining power."

[No Specification enrolled.]

A.D. 1827, February 1.—N° 5455. (* *)

OLDHAM, John.—" Improvements in the construction of wheels " designed for driving machinery, which are to be impelled by " water or by wind, and which said improvements are also appli- " cable to propelling boats and other vessels."

" These paddles, or float boards, are moved in such a manner, " that if lines were drawn radiating from the point or top of " the vertical diameter line of the wheel, that is, from the axis " of the upper paddles, through the centre of all the other paddle " axles these lines would all be in coincidence with the planes of " the float-boards or paddles."

Each float turns on a horizontal axis, and is connected by a short crank *e*, with an arm of a second wheel, revolving upon an excentric or circular crank keyed to a hollow shaft, which revolves on the paddle shaft, and terminates inside the inner arms of the paddle-wheel. " The distance between the centre of the circular " crank and its excentrical centre of motion upon the mainshaft " must be exactly equal to the length of the paddle-cranks *e*." The hollow shaft is connected by cog-wheel with the other shaft, so that the motions of both may be adjusted.

[Printed, 10*d*. Drawing. See London Journal (*Newton's*), vol. 14, p. 1.]

A.D. 1827, February 1.—N° 5456.

STIRLING, Robert, and STIRLING, James.—" Air engines." In this invention there are two air vessels with spherical bottoms. Beneath each of these a fire is lighted while the upper parts of the vessels are kept as cold as possible either by their own power of dispensing heat " or by streams of air or water." Each air vessel is furnished with a plunger, consisting of a horizontal ring of cast iron supported by four arms united at the centre to an iron rod, and which ring bears or is connected with two spherical plates three and a half or four inches apart each, composed of plates of sheet iron of the thickness of one-eighth of an inch, and pierced with a multitude of holes about one-fourth of an inch in diameter. The space between the two " is filled up with " successive layers of plates of the thinnest sheet iron in use " pierced with holes " shaped " into a spherical form and kept at

"the distance of two or three times their own thickness from "one another by small indentations." It may also be filled up with small pieces of stone, burnt clay, or any similar bodies. The upper parts of the plungers are made to fit the tops of the air vessels, and their rods are attached to the ends of a beam. The air vessels are connected by pipes to the two ends of a cylinder furnished with a piston. The plungers, when the engine is at work, move from one end of the air vessels to the other. The air passing through the holes in the plungers and from the hot to the cold end of the cylinder is alternately heated and cooled, and its elasticity and consequently the pressure on either side of the piston alternately increased and diminished. The air is supplied to the vessels from a magazine furnished with a safety valve and charged by an air pump.

[Printed, 10*d*. Drawings. See Repertory of Arts, vol. 6 (*third series*), p. 190; London Journal, vol. 3 (*second series*), p. 245, also vol. 42 (*conjoined series*), p. 213; Register of Arts and Sciences, vol. 1 (*new series*), p. 49; Engineers' and Mechanics' Encyclopædia, vol. 1, p. 40.]

A.D. 1827, August 1.—N° 5530.

PARKINSON, WILLIAM, and CROSSLEY, SAMUEL.—Method of constructing heated air-engines. The improvements consist in supplying a "transferer," being a solid or hollow air-tight vessel to move the air from the hot to the cold parts of the differential vessel. The transferer is made of a similar form with the differential vessel, but shorter, so as to leave a sufficient space.

Another improvement is employing gas to heat the upper parts of the differential vessels. The gas is introduced in an iron ring surrounding the vessel, perforated for the emission of jets, and protected by an iron casing, open at the top for directing the heat to the vessel, and by a second outer covering of polished metal.

[Printed, 8*d*. Drawing. See Repertory of Arts, vol. 7 (*third series*), p. 414; London Journal (*Newton's*), vol. 1 (*second series*), p. 299; also vol. 42 (*conjoined series*), p. 213; Register of Arts and Sciences, vol. 2 (*new series*), p. 113; Engineers' and Mechanics' Encyclopædia, vol. 1, p. 42.]

A.D. 1827, December 13.—N° 5585.

PETO, HENRY.—"An apparatus for generating power."

[No Specification enrolled.]

A.D. 1828, April 29.—N° 5644. (* *)

BOMPAS, CHARLES CARPENTER.—"The air or gas may be "condensed by its being disengaged chemically from substances

" with which it is in combination in a confined space; but the best " and cheapest method is to compress atmospherical air by con- " densing pumps, like those in common use for compressing oil or " rosin gas," into cylindrical iron vessels with hemispherical ends, of from 12 to 18 inches in diameter, and from 3 to 12 feet long, which are placed in one or more rows underneath and behind the carriages. Fixed reservoirs are stationed at appropriate places, into which the air or gas is condensed, and which are kept filled, that the carriage or vessel may be supplied rapidly.

"The locomotive reservoir should be filled with air, condensed " under a pressure of from 30 to 150 atmospheres, or even up- " wards." Motion is communicated to carriages by admitting the compressed air into a cylinder alternately above and beneath a piston, while the opposite side communicates with the external air, and by means of a crank the alternate movement communicates a circular motion to the carriage wheels. "It is better to " have two cylinders to each carriage," and the air may be worked expansively.

2. The pistons may communicate with paddle wheels by intermediate cranks; the method is advantageous for ferry boats, or for short distances, or for boats too small for steam-engines.

3. The condensed air may actuate a rotary engine, instead of an engine with a piston and cylinder.

[Printed, 4*d*. No drawings. See London Journal (*Newton's, second series*), vol. 2, p. 278; Register of Arts and Sciences (*new series*), vol. 3, p. 23; Engineers' and Mechanics' Encyclopædia, vol. 2, p. 502.]

A.D. 1828, May 31.—N° 5659.

HALL, Samuel.—Steam and gases are generated in an artificial atmosphere much denser than that of the air. For this purpose air is forced by a double acting forcing pump into a generator constructed in three parts, attached so as to form one entire air-tight vessel. The central part contains a cylindrical space for the fuel, and in the sides are cast or formed a series of tubes for water, which communicate with each other. Part of the steam generated passes into the tube supplying the fire with compressed air. The rest of the steam, together with the air, steam, and gases which have come from the fire, is conducted into a series of tubes similar to and alternating with the water tubes in the sides of the cylinder. The steam and gases afterwards pass into a reservoir heated by an external fire, and thence into the working

cylinder, whence after having acted on the piston they are discharged. In order to obtain the proper pressure in starting the engine, water is introduced into the reservoir, and converted there into steam.

[Printed, 1*s*. 8*d*. Drawings. See London Journal (*Newton's*), vol. 8 (*second series*), p. 123; Mechanics' Magazine, vol. 12, vol. 13, pp. 55 and 133.]

A.D. 1828, December 15.—N° 5736. (* *)

WILLIAMS, RICHARD.—"The application of elastic and dense "fluids to the propelling of machinery." The buoyancy of inverted vessels when charged with an elastic and immersed in a dense fluid is applied as a first mover.

Steam is the elastic fluid supposed to be used in the following description :—

A boiler set over a fire-place is mounted in brickwork in the usual manner. A closed metal vessel or reservoir is set upon the boiler roof which forms its bottom, and the flame and smoke from the fire-place circulate round its sides before they enter the chimney. In the top of the boiler are three apertures into the boxes of three sliding valves, which open and shut the communication with three vertical receivers placed on the top of the boiler within the reservoir, each of which has a valve in its top opening upwards. Over each receiver a large vessel, closed at the sides and top, and open at the bottom, is suspended by a rod working steam-tight through the cover of the reservoir, and is hung on the neck of a crank on the mill shaft, and kept steady in its vertical movement by rollers on its sides running between guide rods; a valve on the roof of each inverted vessel is moved by a spring catch, when the vessel rises and falls. The reservoir is filled with oil or some dense fluid, and the inverted vessels and receivers are immersed in it, and so arranged that when one vessel is at the top of the reservoir, the second vessel is near the middle, and the third at the bottom. The apparatus being in action, the steam from the boiler is admitted through the slide valve into the receiver that is under the lowest inverted vessel, and escapes, through the valve in its cover, into the oil with which the vessel is filled, expels it into the reservoir, and as the inverted vessel is emptied, it rises by its buoyancy through the oil, turns the crank to which its rod is attached, and on reaching its greatest elevation lifts a valve, through which the steam escapes into the atmosphere.

As this vessel was ascending and turning its crank, it also caused the second inverted vessel to descend through the oil to the bottom of the reservoir, and occupy a position to receive a charge of steam from the reservoir, which, expelling the oil from the inverted vessel gives it buoyancy, and in rising turns its crank, and places the vessel that has risen in the middle of the reservoir, and the third in a position to descend over and enclose the receiver, "and by successively filling and emptying the inverted "vessels, an uniform rotary action is produced by the triple "crank axis with which they are connected."

[Printed, 6*d*. Drawing. See Repertory of Arts](*third series*), vol. 9, p. 25; London Journal (*Newton's second series*), vol. 4, p. 331; Register of Arts and Sciences (*new series*), vol. 4, p. 17.]

A.D. 1829, January 14.—N° 5756.

HEWES, THOMAS CHEEK.—"Improvements in the form and "construction of windmills and their sails." The first of these consists in varying the speed of the flour [stones and machinery, by causing the motion to be transmitted from the vertical to a horizontal shaft, either directly through a bevil or indirectly to another horizontal shaft supporting several wheels of different sizes, by any of which the motion may be returned to the first-mentioned horizontal shaft.

The second is to combine a vane or weathercock, with the "helm sails" in such a way that the motion of the vane brings the helm sails to a position more perpendicular to the direction of the wind than they are when the vane is at rest. They can, in consequence, be made smaller than usual.

The third is an improvement in bracing or framing the main sails. Two whips, a back and a front one, are used for each sail which radiate from points on the opposite sides of the wind shaft, and intersect at a short distance from the centre.

[Printed, 10*d*. Drawing. Repertory of Arts, vol. 8 (*third series*), p. 513; London Journal (*Newton's*), vol. 5 (*second series*), p. 16.]

A.D. 1829, April 28.—N° 5784.

PICKERING, PETER, and PICKERING, WILLIAM.—"An "engine or machinery to be worked by means of fluids, gases, "or air, on shore or at sea, and which they intend to denominate "'Pickerings' Engine.'"

[No Specification enrolled.]

A.D. 1829, June 1.—N° 5797.

MANN, William.—Application of compressed air power. The compressed air is used to form a depository of mechanical power, by the aid of which the power generated and produced by steam engines, windmills, water mills, treadmills, and other machinery may be packed and made portable. These engines and mills compress the air to any required density by using condensing pumps of different capacities, those used to compress the higher densities being proportionably smaller than those previously used to compress the fluid at the first or lower densities. The air may be conveyed to places where it is required by being packed in portable reservoirs, or else through metallic pipes the same as gas. For lines of coaches, as that from London to Newcastle, steam engines may be erected at certain stations, but the best way to supply a long line is by pipes. Ships and floating bodies are supplied with reservoirs laid down in the hold. The cranes in a dock, or the guns in a fortified town may be worked or supplied with compressed air.

[Printed, 6*d*. No Drawings. See Repertory of Arts, vol. 9 (*third series*), p. 96; London Journal (*Newton's*), vol. 8 (*second series*), p. 317; Register of Arts and Sciences, vol. 4 (*new series*), p. 164, also vol. 5, p. 90; Engineers' and Mechanics' Encyclopædia, vol. 2, p. 502.]

A.D. 1829, October 28.—N° 5859.

FULLER, Thomas John. — "Improved mechanical power "applicable to machinery of different descriptions."

[No Specification enrolled.]

A.D. 1830, January 21.—N° 5882.

DAKEYNE, Edward, and DAKEYNE, James.—Applying the power or pressure of water, steam, or other elastic fluids. The fluid used revolves through a circular groove formed round the equatorial circumference of a globe having ingress and egress through two narrow openings close on each side of a stop or partition fixed stationary in the channel. The fluid by pressure on the planes of a circular plane placed obliquely, and called the ecliptic ring, causes the poles of the globe to revolve conically on its centre. This motion is communicated to machinery by a taper shaft fixed in the upper pole of the globe, and whose other end is attached by a collar, in which it revolves to the end of a

radial arm fixed to the shaft. A semicircular ring connects the ecliptic ring to the pole or rod or taper shaft.

[Printed, 1*s*. Drawing. See Repertory of Arts, vol. 11 (*third series*), p. 1; London Journal (*Newton's*), vol. 9 (*second series*), p. 19; Mechanics' Magazine, vol. 18, p. 242; Register of Arts and Sciences, vol. 5 (*new series*), p. 101.]

A.D. 1830, June 19.—N° 5943.

BRUNTON, Thomas, and FULLER, Thomas John.—"An "improved mechanical power applicable to machinery of different "descriptions."

[No Specification enrolled.]

A.D. 1830, June 29.—N° 5947.

PARKER, Samuel.—An equable and controllable power applicable to raising fluids or other purposes is obtained from the evolution of gas produced by dissolving zinc or other substances in sulphuric or other dilute acids. The substance to be dissolved should be in pencils of equal size in their length from end to end, except the base, which is always to be coned. The pencil falling by its own weight as the point is dissolved, presents the same extent of surface to the acid, and an equal and constant supply of gas is obtained. An example is given of the application to a lamp, in which the gas passes into the oil chamber, and gradually forces the oil to the burner.

[Printed, 6*d*. Drawing. See London Journal (*Newton's*), vol. 4 (*conjoined series*), p. 185; Register of Arts and Sciences, vol. 5 (*new series*), p. 262.]

A.D. 1830, August 5.—N° 5967.

STREET, John.—Rotary engine. This consists of two distinct cylindrical vessels, through the centres of which a hollow axle passes. A piston stands out radially from the axle in each cylinder, the two pistons being in opposite directions. A rectangular box is formed over each cylinder by removing part of its circumference and forms with the cylinder the close vessel the piston moves in. From one side of the box a valve or steam stop consisting of a rectangular plate of iron hangs mounted on a pivot. The lower edge of the valve bears upon the periphery of the axle. Steam passes from the axle into the first cylinder, and drives round the piston, which lifts up the valve when it reaches it, and the steam then passes into the second cylinder. The valve

may fall back by its weight. It may be furnished with a counterbalance weight, and is sometimes made so as to be raised by wipers on the exterior of the cylinder. The axle may also be made hollow, and steam introduced by valves worked by a rotary cam. The gravity of water or the expansion force of steam, gas, or condensed air, or any other elastic vapour, may be used as the motive power.

[Printed, 1*s*. Drawing. See Repertory of Arts, vol. 10 (*third series*), p. 339, and vol. 11 (*third series*), p. 65; London Journal (*Newton's*), vol. 6 (*second series*), p. 70; Register of Arts and Sciences, vol. 5 (*new series*), p. 167.]

A.D. 1830, October 13.—N° 6010.

NAPIER, David.—" Improvements in printing and pressing " machinery, with a method of economising the power applied to " the same, which method of economising power is applicable " to other purposes." This method consists in applying one or more springs, similar to those of a clock, between the mover and the moved, which springs are being continually wound up by turning round the spring box by a lever provided with a catch which acts on the ratchet of the box. As the lever has no instantaneous effect on the fly wheel it may be applied to explosive or steam engines, especially when it is an object to dispense with the crank as in locomotives.

[Printed, 8*d*. Drawing. See London Journal (*Newton's*), vol. 8 (*conjoined series*), p. 427; Register of Arts and Sciences, vol. 6 (*new series*), p. 65; Engineers' and Mechanics' Encyclopædia, vol. 2, p. 350.]

A.D. 1831, December 22.—N° 6204.

HALL, Samuel.—The invention consists,—

First, in a piston for steam, gas, or other engines, contrived so that the pressure of the fluid on whichever of the two sides of the piston it acts shall force the packing into closer contact with the sides of the cylinders. The piston is composed of a middle block fastened to the rod, and of a bottom and cover screwed to the block in such a manner as to allow them to approach rather nearer the block on sufficient pressure. The packing is placed round the block between the edges of the cover and bottom.

Secondly, in valves for steam, gas, or other engines, composed of a sliding frame and a seat plate on which the frame works. The frame is constructed so that each side, end, or other part, has its separate bearing on the plate. The frame has four grooves ar-

ranged in a square. Each groove receives first a slip of metal, then the packing of linen or cotton, and the top and bottom grooves also receive the ribs of face plates. The seat plate is perforated with hollow channels to allow the hot fluid to enter freely. Packing is placed between the cylinder block and the seat plate. The sliding frame is kept in its place by bars and a plate placed at the back, and by means of these bars and screws the regulation of the pressure of the different parts against the seat plate is effected. Springs or elastic packing must be substituted for the screws when the backs of the valves require steam-tight packing.

Thirdly, in a method of lubricating the engines which consists in repeatedly injecting by a small force pump of the same oil or other lubricating matter either into the working cylinder, or preferably into the pipe from the boiler or generator between the throttle valves and the valve or cock to the working cylinder. After passing through the cylinder and lubricating the piston and rod, the lubricating matter is ejected with the gas or other fluid into a vertical pipe whose upper end is open to the atmosphere, and whose lower end terminates in a vessel of water. The oil falls into and floats on the water, whence it passes by a pipe back to the forcing pump.

[Printed, 2*s.* 8*d.* Drawings. See Repertory of Arts, vol. 14 (*third series*), p. 321; London Journal (*Newton's*), vol. 1 (*conjoined series*), p. 361; Mechanics' Magazine, vol. 18, pp. 66, 86, 156, 183, 271, 324, 440, and vol. 19, pp. 20 and 182; Register of Arts and Sciences, vol. 7 (*new series*), p. 273; Queen's Bench Reports, vol. 5, p. 233.]

A.D. 1832, November 8.—N° 6331.

BURLINGHAM, John.—"Improvements in mills." The space swept out by the revolution of the sails is "appropriated to the "reception of any convenient number of vanes or sails so that "they form nearly one continuous circle." The said circle is enclosed at its periphery "with a ring or pologonal figure of any "width with its plane at right angles to the plane described by the "motion of the vanes." The vanes may be turned from the wind by means of two sails with cross heads passing through the wind shaft.

[Printed, 2*s.* Drawings. See Repertory of Arts, vol. 15 (*third series*), p. 77; London Journal (*Newton's*), vol. 13 (*conjoined series*), p. 396.]

A.D. 1832, November 30.—N° 6339. (* *)

HOWARD, Thomas.—Vapour engine. A wide, shallow, slightly convex metallic vessel is set over an enclosed fireplace. The vessel

is covered with a sheet or lid of plate iron, which has a number of wrought-iron cups or hollow cylinders, closed at their lower ends, inserted downwards through it to within a small distance of the bottom of the convex vessel. The space enclosed between the plate and its cups and the convex vessel is filled with mercury, and to retain it in contact with their under surfaces, a tube filled with the fluid metal rises from the highest part of the under surface, and communicates with a small iron vessel that receives any overflowings of the mercury from its expansion. A communication is made between this vessel and the vapour chamber to relieve unequal pressure.

Above the centre of the plate and iron cups is a brass hemisphere, pierced with small holes, and connected to a force pump, by which alcohol (or water) is injected and dispersed in a fine shower over the upper surfaces of the iron plate and cups. Previous to injection the alcohol is warmed by its passing through a tube containing heated water, and a small sliding valve connected with a lever and cam regulates the quantity injected. About three square feet of heated surface, and one square foot of fire surface are required for one horse power.

A pipe from this vapour chamber opens into the working cylinder above and beneath the piston alternately; and another pipe opens in the same manner from each side of the piston to the condenser,—a cylindrical vessel, with a hemispherical head,—around which, at a small distance, is carried a "worm," that opens at one end into the condenser, and at the other end into a pipe connected with an air pump.

Two pipes descend from the bottom of the receiver into a horizontal tube; the condensed fluid that falls through them is drawn off by a pump, and forced through the pipe containing hot water into the injection pipe. The greater part of the condenser, worm, pipes leading from it, and pumps are surrounded with cold water, and the heated gases from the furnace are carried round the vapour chamber of the working cylinder before entering the chimney, and a blowing machine supplies air to the furnace.

The operation of the engine is similar to that of Watt. The mercury in the convex vessel is highly heated, and the alcohol injected from the perforated hemisphere in a fine shower upon the hot surfaces of the iron plates and cups, is turned into vapour, which rises into the annular space round the cylinder, and thence, through valves into the cylinder above and below the piston, and

the worked vapour from each side of the piston then enters the condenser, and coming in contact with its sides falls as fluid through the pipes in the bottom of the condenser into the horizontal vessel, from which it is raised by the pumps into the upper orifice of the worm; descending through this vessel it is further cooled, and admitted in a jet to spread itself on the sides of the condenser, and fall to the bottom of the cylinder and thence into the horizontal pipe, from which it is drawn by the pumps, to be again injected into the vapour chamber.

The patentee refers to the Specification of a prior grant of Letters Patent, No. 5262, A.D. 1825, p. 26, and disclaims "the "lifting pump withdrawing a quantity of liquid from the bottom "of the condenser," as described therein.

[Printed, 8*d*. Drawing. See Repertory of Arts (*new series*), vol. 3, p. 213; London Journal (*Newton's conjoined series*), vol. 13, p. 385; Mechanics' Magazine, vol. 21, p. 410; also vol. 22, pp. 30, 40, and 432.]

A.D. 1833, January 9.—N° 6357.

REYNOLDS, John.—This invention consists in part of a steam engine and of an air compressing apparatus or engine in which a rotating piston either compresses air or is impelled by it without altering the direction of the rotation. In this way compressed air is used as an accumulation of power and will supply some of the purposes of a fly wheel. The cylinder is an annular tube having an opening along the whole of the inner side which coincides with the face of a revolving ring to which is attached a piston holding a ring with inverted edges. This ring is made rather larger than the cylinder into which it is compressed and fits accurately. The cylinder has two recesses or valve boxes which receive the sliding valves. These valves have rods and levers communicating with a tappet. Parallel to the cylinder is an annular air chamber having a passage to a reservoir. The revolving ring has four passages through it, two furnished with stop-cocks forming communications between the cylinder and the atmosphere, and two with valves (having springs which keep them closed unless forced up by the pressure of the atmosphere) between the cylinder and the air chamber. One of these last passages is closed when the engine is used to compressed air, and opened by a lever and adjusting screw when the engine is impelled by the air. Behind the other of these passages is a groove which when it is opposite to a sliding valve makes a passage

between the two sides of the valve. Of the first two passages the cock of one is opened when the air is being compressed and the cock of the other when the air impels the piston.

[Printed, 1s. 10d. Drawings. See London Journal (*Newton's*), vol. 14 (*conjoined series*), p. 327.]

A.D. 1833, April 4.—N° 6409.

ERICSSON, JOHN.—This invention consists "in an engine "charged with air of any required density and worked by the "expansive force of a portion of that air, which is heated by "exposing its particles in a constant state of change or inter-"mixture to heated surfaces of metal in a manner requiring less "fuel than heretofore (that is to say), first, in a stove or furnace "which generates the original degree of heat required to work "the engine, and then in a vessel which I call a regenerator or "heat returning apparatus and which vessel having been once "brought to a proper temperature continually transfers the heat "from the air escaping from the working cylinder to the air "entering into it." The regenerator consists of a vessel fitted with a great number of tubes passing through plates. The hot exhaust air is drawn through the tubes; it then passes into a double acting cylinder and piston and is forced through a tube cooled by water and afterwards made to circulate round the tubes in the regenerator by means of the plates before it passes back into the furnace. The engine is made air tight so as to work at a high pressure.

[Printed, 1s. 2d. Drawings. See London Journal (*Newton's*), vol. 15 (*conjoined series*), p. 284, and vol. 42 (*conjoined series*), p. 213; Mechanics' Magazine, vol. 20, pp. 81, 191, 233, 250, and 336.]

A.D. 1833, November 5.—N° 6502.

WASS, JOSEPH.—"Certain mechanical powers which may be "made applicable to various useful purposes."

[No Specification enrolled.]

A.D. 1833, November 19.—N° 6510. (* *)

PREDAVAL, BARTHELEMY RICHARD, COMTE DE. — "An "engine for producing motive power, applicable to various pur-"poses."

This invention consists "in a rotary engine receiving its motion

"from the buoyancy of any suitable fluid acting on one part of "it, and from the inclination of a corresponding part to fall by its "own weight in vacuo." The machine for effecting this consists of a case in which a hollow cylinder or drum revolves on an axis. The case is divided into two unequal parts, the larger being filled with water, and the air being exhausted from the smaller. "It "results from a machine so constructed that that part of the drum "which is in the water will have a constant tendency to rise or be "buoyed up by the water, while the other part of the drum which "is in vacuo will have as constant a tendency to fall, or, in other "words, that part of the drum which is in vacuo will always be "heavier than that which is in the water, and the consequence will "be that the drum will be constantly turning on its axis so long "as the vacuum is kept up in one part of the machine and the "water is in the other." "The axis in that case may be made "to turn any working shaft."

[Printed, 6*d*. Drawing. See Repertory of Arts, vol. 2 (*new series*), p. 65; London Journal (*Newton's*), vol. 5 (*conjoined series*), p. 60.]

A.D. 1833, December 16.—N° 6525.

WRIGHT, LEMUEL WELLMAN.—Explosive engine. Carburretted hydrogen gas and common air are forced into two reservoirs; that for the gas has a regulating mechanical gauge, by which a cock is turned when the pressure of the gas is too great; that for the air has a lifting valve properly located, through which the air escapes when the pressure is too great. The gas and air pass into two chambers each provided with a piston, which are made adjustable upon the central rod by screws with tightening nuts. The screws are connected with governor balls, by which the pistons may be depressed or raised, and the quantities of gas or air increased or diminished. Two passages closed by valves or cocks, which are made to reciprocate by the action of toothed wheels, lead the air and gas into a common passage, also provided with a valve, which reciprocates to open or close alternately the passages to two globular chambers, in which the mixture is exploded by a small gas flame issuing through a touch-hole, over which is a sliding plate to prevent the escape of the explosive gases. The globular chambers communicate with a cylinder above and below the working piston respectively. The rod of the working piston is made hollow, and supplied with water, which flows through the packing

of the piston, to lubricate and keep it cool, and the working cylinder is enclosed in a cold water jacket.

[Printed, 10*d*. Drawing. See London Journal (*Newton's*), vol. 5 (*conjoined series*), p. 137; Rolls Chapel Reports, 7th Report, p. 148.]

A.D. 1834, March 29.—N° 6585.

DOUGLAS, John Cooper.—The invention consists, first, in obtaining motive power by two pistons acting at the opposite ends of a cylinder divided into two parts by a fixed division, and having at each end a valve. The cylinder has water chambers and an outer jacket filled with water or other fluid. The pistons and rods are forced out, leaving a vacuum in each division. One of the valves is opened, and the pressure of the atmosphere then drives the cylinder in the direction of the closed valve. When it has arrived at the end of the parallel motion in guide, the first valve is shut and the other valve opened. Thus, the apparatus is caused to run back, and by continuing alternately to open and shut the valves, an alternate rectilinear motion is produced.

Secondly. A method of increasing the said motive power by using (instead of a crank) a double rack, whereby two semicircles of teeth are made to revolve, so as to give and maintain a continuous uniform motion round the circle. According to the length of the circle of the segmental wheels, so is the increased power.

Another part is for throwing projectiles by an instrument having two cylinders, the upper one used as an air decanter. The lower one has a valve, which, being opened, a vacuum space will instantly be closed, and thereby the piston of the air chamber (which is represented as attached to the same frame as that of the lower cylinder,) will be brought down suddenly, and the air will drive the projectile before it.

[Printed, 1*s*. Drawings. See London Journal (*Newton's*), vol. 17 (*conjoined series*), p. 297; Rolls Chapel Reports, 7th Report, p. 151.]

A.D. 1834, May 24.—N° 6614.

DE CHAPEAUROUGE, Philip Augustus.—(*A communication.*)—"A machine, engine, or apparatus for producing motive "power, which he denominates 'a self-acting motive power,' and "called in France by the inventor 'voland moteur perpetual.'"

[No Specification enrolled.]

A.D. 1834, July 26.—N° 6649.

HALE, William. — "Windmills." This invention consists, "first, in supporting the shafts which each carry two sails or vanes "midway or at the centre of resistance, whereby the wind or "water pressing respectively on the two sails, one on each side "of the bearing or axis, the shaft will be equally pressed on both "sides; secondly, in supporting such windmill on a fixed and "stationary post." The mill to which these improvements are applicable is a horizontal mill of which each sail is made to move half round on its own axis in every revolution of the frame, by means of a centre toothed wheel, which remains stationary and turns several wheels, one corresponding to each sail, and being half the diameter of the centre wheel. Each of the wheels is connected by a shaft to a pinion which moves a wheel connected with the sail, and is four times the diameter of the pinion. The central wheel may be moved round by an arm or lever, so as to shift the sails according to the direction of the wind.

[Printed, 1s. Drawings. See London Journal (*Newton's*), vol. 20 (*conjoined series*), p. 368.]

A.D. 1835, August 24.—N° 6890.

SCHWARTZ, Theodor.—"Practical applications of known "principles to produce motive power." The principles are, that water will absorb 480 times its bulk of muriatic acid gas, and 505 times its bulk of ammoniacal gas, that water of the same temperature always takes up the same bulk of each gas, whatever be its density, and that the gases still retain their elasticity. The practical application consists in making water absorb large quantities of gas (ammoniacal is preferred) at a high pressure, and then allowing a part of the gas to escape into and act on the piston of a cylinder. A vacuum is produced on the opposite side of the piston by absorbing the gas by a jet of water, from which it "may afterwards be separated by a gentle heat and be "again compressed into water in a proper reservoir."

[Printed, 4*d*. No Drawings. See London Journal (*Newton's*), vol. 7 (*conjoined series*), p. 215; Rolls Chapel Report, 7th Report, p. 162.]

A.D. 1836, April 9.—N° 7057.

COPLAND, Robert.—"Improvements upon patents already "obtained by him for combinations of apparatus for gaining "power."

[No Specification enrolled.]

A.D. 1836, April 23.—N° 7066.

STANSFELD, HAMER.—(*A communication.*)—" Machinery for a " method of generating power applicable to various useful " purposes."

[No Specification enrolled.]

A.D. 1836, April 26.—N° 7072. (* *)

TAYLOR, WILLIAM, and DAVIES, HENRY.—" Improvements " in machinery or apparatus for introducing water or other fluid " into steam boilers or evaporating vessels, also for obtaining " mechanical power by the aid of steam, and for communicating " motion to vessels floating in water."

Two " feeding vessels " are each attached by two hollow arms to a " supply cock " which has four " ways " or passages in its plug that coincide with four apertures in its " case." One of the pipes of each feeding vessel leads from its upper end into a way in the " cock plug " that communicates with a pipe from the water reservoir. The other pipe in each vessel leads from its lower end into the passage in the plug that communicates with the boiler. The whole apparatus librates on the plug as an axle. Either of the feeding vessels being in its lowest position, the other is at its highest, the latter filled with steam, the lower with water. In this arrangement of the valves water from the reservoir descends through the plugway, rises into the pipe that opens into the higher feeding vessels, and condensing the steam it contains, flows into the feeding vessel. During this operation the steam has been flowing into the lower vessel through its upper pipe, and the water it contained has run through its lower pipe into the boiler. The opposite feeding vessel now preponderates, and in its descent turns the ways of the plug into a reverse position, and in falling to its lowest level has raised the opposite vessel, now filled with steam, to its highest limit, and commences the return movement, each vessel alternately transferring a quantity of water into the boiler.

Another feeding apparatus operates by means of a sliding valve, opening and closing alternately the orifice of a pipe to the boiler and another to the reservoir.

A rotary engine. The steam chamber is formed of a portion of a sphere, and revolves on an axle. A piston extends across the chamber, and is fixed to it, and a disc is mounted on a shaft which is placed at an angle to that of the chamber, and terminates in a

ball that works in socket pieces. A part is cut out of the disc, to form a slot, through which the piston may pass, and the steam enter upon and escape from both sides of the disc. The induction and eduction passages are placed one on each side of the piston, and opposite the sides of the slot. The chamber, its piston, and the disc travel together, revolving in the same direction, and the obliquity of its shafts causes the disc in its progress to divide the steam chamber diametrically at an angle to its axis into compartments for induction and eduction steam, and at the same time maintain the (steam-tight sliding) contact between the disc and side of the chamber, and prevent the steam causing them to separate. The chamber and disc revolving together, the disc travels from side to side of the periphery of the chamber; the piston passes through the slot in the disc, and gradually travelling from the line of contact between the disc and chamber during one half revolution, and approaching the line during the other half, opens a new steam chamber, and that compartment which is in connection with the induction steam is caused to communicate with the eduction passage. "In this way the induction compart-" ments are continually changing, increasing on one side of the " disc and diminishing on the other. There never is any cessa-" tion of steam passing into the chamber on one side of the piston, " or flowing out from the other side, for the change of induction " steam takes place whenever the disc and chamber become coin-" cident with the passages on each side of the piston, and is " effected without any change of valves, steam stops, or leaves, " or other movable parts."

Describes four modifications of the preceding engine. 1. The chamber is stationary. The disc moves within the chamber, with an undulating vibratory motion, its shaft performing the figure of a cone, having its apex in the centre of the ball that moves in the socket pieces. 2. The disc is dished or conical, the chamber being a different portion of a sphere to the preceding. 3. The disk is dished, but placed on the ball (which is smaller) in a different position to that in No. 2. 4. The steam chamber is a cylinder in which two pistons revolve, one attached to the cylinder which moves on a hollow shaft, the second fixed on a separate shaft which passes through the other. The pistons revolve in the same direction, but at different speeds; each piston alternately forms the steam abutment for the other. That which forms the abutment moves through a portion of the entire revolution a sixth or

an eighth, while the other in the same time makes the remaining five-sixth or seven-eighths of the revolution. The piston forming the abutment moves slowly out of the way of the other, which having completed its portion of a revolution decreases its speed and becomes an abutment, and the piston which had been an abutment accelerates its speed; the one performing a portion of a revolution and the other the whole. The minute descriptions given of these combinations are illustrated by numerous drawings.

A method of propelling a boat by a paddle at the stern is described.

[Printed, 3s. 2d. Drawings. See London Journal (*Newton's conjoined series*), vol. 18, p. 97; Mechanics' Magazine, vol. 29, pp. 51, 106; Rolls Chapel Reports, 7th Report, p. 174; Engineers' and Mechanics' Magazine, vol. 1, p. 216.]

A.D. 1836, May 18.—N° 7099.

BECK, THOMAS.—"New or improved apparatus or mechanism "for obtaining power and motion to be used as a mechanical "agent generally, which he intends to denominate 'Rotæ "Vivæ'."

[No Specification enrolled.]

A.D. 1836, July 11.—N° 7144.

HEATH, MATHEW.—"New mechanical combinations for "obtaining power and velocity, applicable to the propelling of "vessels, raising of water, and to machinery of various descrip-"tions."

[No Specification enrolled.]

A.D. 1836, September 1.—N° 7179.

SURREY, JAMES.—Using compressed air in lieu of steam for the purpose of working engines hitherto worked by steam.

The atmosphere is compressed by one or more pumps worked by manual or horse labour, steam, or other power; and the engine is supplied by a pipe from the reservoir with compressed air in the same way as the steam engine with steam from the boiler. Stationary engines are supplied either by tubes similar to gas pipes, or by filling portable vessels at the reservoir and carrying them to the engine. Locomotives for short distances may be supplied by portable vessels attached to the engine or fixed on a

tender. On railways of a length beyond that for which a supply of air can be conveniently carried, there may be either a tube from the original depôt of compressed air running the length of the railway and having cocks at suitable stations, or portable vessels of compressed air may be carried to such stations. Several small reservoirs are better than one large vessel, as when one reservoir has been partially used it may be reserved for descents and places where little power is required; while for ascents and at first starting a new reservoir may be opened. A pressure of four hundred pounds to the square inch is sufficient for all practical purposes.

[Printed, 4*d*. No Drawings.]

A.D. 1836, November 5.—N° 7216.

COPLAND, Robert. — Improvements upon patents already obtained. These consist in adding outside the inner cylinders in the invention described p. 48, No. 4749, cases for the purpose of receiving and returning the water or other fluid rising and falling in the cylinders. The case of the inner cylinder in one series communicates by a pipe with the bottom of a cylinder in the other series. The cases are made to collapse and expand in certain parts.

[Printed, 10*d*. Drawing.]

A.D. 1836, November 24.—N° 7235.

WOOLLAMS, Joseph.—" Certain improved means of obtaining " power and motion from known sources."

[No Specification enrolled.]

A.D. 1836, December 3.—N° 7238.

CARVALHO, David Nunes. — Improvements in propelling vessels and carriages.

These consist in using the power of a current of water or air to turn a plane horizontally round a vertical axis. The sails are made of triangular prisms, and inflexible sheets arranged alternately. The sheets hang from the lower edges of prisms, but can only open towards the side to which the flat sides of the prisms are turned.

[Printed, 6*d*. Drawing. See Repertory of Arts, vol. 8 (*new series*), p. 142.]

A.D. 1836, December 15.—N° 7255.

BECK, RICHARD THOMAS.—(*A communication.*)—" New or im-" proved apparatus or mechanism for obtaining 'power and motion to be used as a mechanical agent general, which he in-" tends to denominate 'Rotæ Vivæ."

[No Specification enrolled.]

A.D. 1837, March 15.—N° 7325. (* *)

DAVIES, HENRY.—Rotary engines. The induction and eduction passages are formed within and around a stationary conical collar on which the cylinder revolves, and through which the shaft of the working disc passes, instead of the cone being fixed upon the cylinder and revolving with it as in the engine described in Specification No. 7072, A.D. 1836. The rotary engine is adapted to raise fluids. The cylinder is stationary and placed in the fluid, and the disc is moved by vibrating rods driven by a crank. The engine may be applied to blow air into a furnace. In a modification the cylinder is stationary, and need not be placed in the water. It may be adapted for use as a " forcing engine for im-" pelling fluids from one situation to another." The disc is stationary with its central hollow ball and shaft; the ball is divided by a partition into two chambers, one open to the supply pipe, the other to the discharge pipe. The cylinder performs the movement of the disc. As the crank shaft revolves the cylinder moves with an oscillating motion about the central ball without its performing a rotary movement, whereby a partial vacuum is produced within the cylinder on one side of the disc, and the fluid rises into it; while the fluid on the other side of the plate is forced into the discharge pipe.

[Printed, 1*s*. 7*d*. Drawings. See London Journal (*Newton's conjoined series*), vol. 19, p. 18. Rolls Chapel Reports, 7th Report, p. 184.]

A.D. 1837, May 30.—N° 7381.

WOOLLAMS, JOSEPH.—" Certain improved means of obtain-" ing power and motion from known sources."

[No Specification enrolled.]

A.D. 1837, August 9.—N° 7415.

BECK, RICHARD THOMAS.—(*A communication.*)—" A new or " improved apparatus or mechanism for obtaining power and

"motion to be used as a mechanical agent generally, which he "intends to denominate 'Rotæ Vivæ.'"

[No Specification enrolled.]

A.D. 1838, January 20.—N° 7547.

ADOR, Ambroise.—"Motive power."

In this invention a stream of hydrogen gas is obtained by the action of acid contained in a cylindrical vessel upon certain metals, such as zinc or iron. Small portions of these metals are placed on a plate with an opening in the centre situated at the upper part of the cylindrical vessel, and by raising a safety valve portions are thrown into a vessel suspended by a chain passing over a pulley, which vessel may be lowered into the acid. The gas passes by a pipe opening above the perforated plate into the safety chamber, and thence to another vessel, where it is ignited by coming in contact with spongy platina, and becomes of high elastic force. The ignition is stopped from spreading backwards by three valves in the safety chamber. This chamber has also two other valves, which under an excess of pressure permit a certain quantity of gas to escape. The elastic force acquired by the gas is used a substitute for steam.

Another apparatus adapted to a boat consists in a double rotatory engine on the principle of "Barker's mill," having six hollow bent arms, the extremities of three pointing in one direction, and the other three in the opposite. According as the gas is permitted to flow off by one set or the other, so will be the direction of the rotatory motion. The engines are fixed to axes carrying paddles or propellers.

[Printed, 1s. 4d. Drawings. See Repertory of Arts, vol. 10 (*new series*), p. 153.]

A.D. 1838, January 27.—N° 7553.

BATE, William.—Power is obtained by fixing an upright shaft on a horse mill shaft. Cross shafts are attached to the top of the upright, and deals fixed by shackles to the extremities of the cross shafts. A frame, twenty feet long by eight feet wide, is made by splitting the thick ends of deal poles, and connecting them by two cross bars. This is clothed with canvass or other material, and fastened on a pin, and by it fixed in the brass holes of the three-sided iron described in the plan, which is fastened on one of three deals at the extremity of the shaft. By exposure

to the wind the power required is obtained. It is regulated by suspending frames of canvass weighted at the bottom, which give way at the bottom according to the weight fixed.

[Printed, 8d. Drawing.]

A.D. 1838, March 19.—N° 7597. (* *)

VICTOR, DUCHEMIN.—Rotary engine "to be worked by steam "or other æriform fluids." The inner cylinder is concentric with the outer, and revolves. Two abutment stops are fixed on the concave surface of the outer fixed cylinder; and four pistons or valves are contained in the hollow arms of the inner cylinder, and are protruded across the annular space between the cylinders by a mechanism fixed on the axle, and kept in steam-tight contact with the concave surface by springs, and by the same contrivance are withdrawn within the arms as they pass in rotation over the curved surface of the abutment stop. The admission of steam between a piston and an abutment and the exit of the worked steam are regulated by a fourway cock. A regulating screw acts on a wedge inserted under the bearing to raise the axle to its true position, should it get loose or deviate through wear.

[Printed, 1s. 4d. Drawings. See Repertory of Arts (*new series*), vol. 10, p. 65; Mechanics' Magazine, vol. 30, p. 225.]

A.D. 1838, April 18.—N° 7615.

BARNETT, WILLIAM.—Obtaining motive power from inflammable gases such as hydrogen or carburetted hydrogen gas. The first engine described is single acting. A double acting pump supplies air to a receiving chamber, and also draws off the unconsumed gas from the cylinder. Another pump supplies hydrogen or other inflammable gas to the receiver. The explosive mixture is admitted below the piston of the cylinder, and ignited by an igniting cock. This has a shell with two narrow slits, one applied to a corresponding aperture in the cylinder, and the other immediately over a gas burner. The plug is hollow, and has a single slit which, as the plug is turned, communicates with either of the slits in the shell. Within the cock is another gas burner which is lighted by the external burner. The second engine is double acting with two hydrogen or gas pumps, and a pump for air, two receivers, and two igniting cocks. A third engine is double acting, but in it the explosive mixture is ignited while under pressure by spongy platina. There are no receivers, but the gases are forced directly into the cylinder. There are three

pumps, an air pump, a gas pump, and an eduction pump, the pistons of all of which make two strokes in one revolution of the fly wheel. During the first half of the descent of the piston of the cylinder the exhausting pump removes the products of explosion from below it, and the air and gas pumps become charged. During the latter half the exhausting air pump is expelling the air or gas it has withdrawn from the cylinder, and the other two pumps are forcing air and gas below the piston. At the completion of the stroke the mixture is exploded, and similar operations and effects are produced and continued. Two cavities fitted with caps at either end of the cylinder contains the platina.

The igniting cocks may also be applied as valves to regulate the passage of steam or other fluids.

[Printed, 1*s.* 2*d.* Drawing.]

A.D. 1838, June 5.—N° 7670.

BECK, RICHARD THOMAS.—(*A communication.*)—" Rotæ Vivæ." They consist of a nave of a wheel turning with the axletree, and " a felloe placed eccentrically to the nave. The felloe and nave " are united by spokes, consisting each of a cylinder and the " rod of its piston. Trunnions connect the cylinder to the felloe " and the rod to the nave." The trunnions of the piston and the piston itself are hollow; by an orifice in the trunnions, which comes in contact with a segment of a circular groove sunk into a fixed disc, steam or gas enters and passes into the cylinder and afterwards escapes by a similar groove on a second disc. Heavy hoops are applied to increase the total weight the felloe has to carry. " In order to obtain the maximum of action " the steam must enter in the cylinders on one side of the axis " of eccentricity and make its exit on the other side." The force of the steam will tend to remove the centre of gravity of the felloe from the vertical line which passes through the centre of the nave, and by the combination of the force of steam and gravity a continuous rotatory motion of the felloe and the nave will be produced. The same principle of eccentricity may be applied to carriage wheels to secure the nave against jerks.

[Printed, 1*s.* 2*d.* Drawings.]

A.D. 1838, June 14.—N° 7688. (* *)

DAVIES, HENRY.—Improvements on that class of rotary engines *wherein the chamber* has the form of the zone of a sphere with

conical ends, the cones pointing to the interior of the sphere, and the chamber is intersected by a disc attached to an axis, placed at such an angle as to cause a radial line on each side of the disc to come in contact with the opposite cone of the chamber. That there shall be that perfect contact of the intersecting discs with the cones of the chamber at the radial lines, as will prevent the passage of the steam, teeth or cogs are projected from each side of the disc, and form part of it; other teeth are projected from the cones of the chamber, and form part of it. The teeth on the cones take into gear with the teeth on the disc, and their surfaces being fitted by grinding, a more extensive and nearly perfect sliding contact is produced between the disc and cones.

The Specifications of two prior inventions are referred to, No. 7072, A.D. 1836, and 7325, A.D. 1837.

[Printed, 1s. 8d. Drawings. See London Journal (*Newton's conjoined series*), vol. 19, p. 153.]

A.D. 1838, July 6.—N° 7721. (* *)

ELKINGTON, HENRY.—"Improvements in engines to be "worked by steam, air, or other fluids." 1. An engine worked by steam expansively in one direction, and in the other by atmospheric air heated nearly to the temperature of the steam by passing through tubes placed in the furnace flue. To render the varying force of the upstroke more uniform, a slot is made in one of the spokes of the fly wheel, in which the crank pin of the crank shaft works, and drives the main shaft with a varying length of lever, or at varying distances from the centre of the shaft. To help the stroke on both sides, the upper part of the air pump is connected with a trough, into which and from which a certain quantity of mercury flows as the piston of the pump ascends and descends; the mercury pressing with the least weight on the air-pump piston at the instant the steam pressure is greatest on the cylinder piston, and as the steam pressure decreases that of the mercury increases, and the main shaft will be driven with a nearly uniform force.

2. Rotary engine. The external cylinder is stationary; the piston is a cylinder mounted on cranks, having a "projecting "plate" attached, which acts as an abutment, and as the piston cylinder revolves in contact with the concave surface of the outer cylinder, the plate enters and passes out of a chamber (attached

to the outer cylinder) more or less, as the piston cylinder approaches or recedes from the recess. The valves are worked from the outside. In a modification of the preceding two cylinders are set side by side; each has a cylindric piston which revolves in contact with the concave surface of its cylinder. Both pistons are attached to a projecting plate which works through an aperture at the junction of the two enclosing cylinders.

3. An engine consisting of a wheel, the periphery of which is hollow and has three valves, each moving on an axis, arranged to be open or to stand across and become partitions of the annular space, when they enter or leave a column of mercury contained in one portion of the hollow periphery. The steam is admitted into a box that bears against the nave of the wheel, in which are the openings to the ends of three hollow spokes. The steam being let on from one of these spokes into the hollow periphery against the lower valve, the mercury acts as an abutment, and the steam wheel revolves.

[Printed, 1*s*. Drawings.]

A.D. 1838, November 8.—N° 7859.

BROMWICH, Bryan I'Anson.—" Improvements in machinery " to be worked by the application of the expansive force of air " or other elastic fluids to obtain motive power."

[No Specification enrolled.]

A.D. 1838, November 13.—N° 7871.

BYERLEY, Anne Bird, and COLLIER, James.—The invention consists in the use of steam or gas, or both combined, in conjunction with the hydrostatic paradox to produce motive power.

Two moveable cylinders, originally filled with water, work over pistons fixed on to the paradoxal pipes which lead up to globes placed at some height above the cylinders and having a capacity exceeding by one-third that of the cylinders. Tubes lead from these globes to valve boxes, which boxes also communicate with a condensing apparatus and with the steam pipe from the boiler. The steam may be aided in its action by hydrogen gas produced by the action of dilute sulphuric acid on zinc or iron filings. The steam and gas are by means of the valves in the valve boxes admitted alternately into the two globes, from which they expel

the water which passes down the paradoxal pipes below the pistons and depresses the cylinders. The steam and gas afterwards pass to the condensation tube. The motion of the cylinders is communicated to toothed wheels which act on a third toothed wheel to which the gear is connected.

[Printed, 10*d*. Drawing.]

A.D. 1838, December 12.—N° 7903.

DEGRAND, JOHN ALEXANDER ELZEAR.—Motive power is obtained first by jets or currents of steam, air, or gas issuing rapidly in a horizontal direction opposite to that in which the locomotion of the apparatus is intended to be effected. The orifice is made trumpet-mouthed, or sometimes with a vertical part with a flange joint which may be added in order to increase the draft. The smoke and hot air from the furnace, and the air heated by being used to condense steam, may be discharged so as to assist the action of steam locomotives made on this principle. Secondly, by the action of steam or heated air forcing up mercury or fluid metal into hollow circular or spiral rims of wheels, which thereby become unequally loaded and are thus made to revolve. The wheels have their lower parts immersed in the fluid metal, and are supported by hollow axles. The metal is pressed into the hollow rims by the difference of pressure on the external mercury and that in the rims, and afterwards driven on by the action of the heated air which enters the rim from the interior of the wheel when the end of the tube leaves the mercury. On arriving at the centre the metal flows back to its original place through the hollow axles. Two wheels with spirals having their mouths at opposite parts should be used. When steam is used the effect is increased by connecting the axle with the condensing chamber.

[Printed, 1*s*. 6*d*. Drawings.]

A.D. 1839, January 17.—N° 7941.

NEWTON, WILLIAM.—(*A communication.*)—"Engines to be "worked by air or other gases."

These are furnished with air vessels heated at one end and cooled at the other; displacing vessels which move the air in the air vessels from one end to the other; "and, thirdly, appa-"ratus or machinery so constructed and connected with the air

" vessel as to transmit the mechanical force resulting from the " alternate dilation and contraction of the air through the medium " of water or some other similar fluid of the kind commonly " called incompressible." The water or other fluid in this way moves to drive the piston of a cylinder. Several engines constructed on these principles are described, and the following additional improvements claimed. First fixing the displacing vessels on arms which are bent down into the cisterns containing the water for driving the piston, and then again pass up through stuffing boxes into the atmosphere. The advantage of this is that when the air in the vessels is at a higher pressure than the atmosphere, the difference of pressure on the rod will aid in supporting the displacing vessel, and by giving a sufficient sectional area to the rods they may be made to balance the weight of the vessels, and may further act as a safety valve by preventing the motion of these vessels when the pressure is too high. Secondly, allowing the air to pass from one end of the air vessels to the other through a pipe filled with metallic surfaces; and, thirdly, " in connecting two air vessels by a passage to be opened " " a little before the change of motion of the displacing vessels " respectively, so as to allow the super-abundance of heated air " to pass from the air vessel in which it exists into the other one " where it will be rendered available towards producing the next " stroke."

[Printed, 1*s*. 6*d*. Drawings. See London Journal (*Newton's*), vol. 18 (*conjoined series*), p. 153.]

A.D. 1839, May 30.—N° 8082.

GORDON, Alexander.—(*A communication.*)—" An improved " machine or apparatus for employing steam or other elastic fluid " as a motive power."

[No Specification enrolled.]

A.D. 1839, June 6.—N° 8093.

PARSEY, Arthur.— Obtaining motive power. An air cylinder is furnished with a cover or telescopic slide top moving up and down, and carrying a cross head frame, to which are attached the rods moving the crank axles. The engineer or operator by a small air pump forces air into the cylinder, which will force the cover up. A rod moves up with the cover, and *it has risen* sufficiently high opens an escape cock, when

sufficient of the compressed air will escape to enable the cover to fall again to its former position.

[Printed, 8d. Drawing. See Inventors' Advocate, vol. 2, p. 185.]

A.D. 1839, June 17.—N° 8110.

BROMWICH, BRYAN I'ANSON.—"Improvements in machinery "to be worked by the application of the expansive force of air or "other elastic fluids to obtain power."

The engine is furnished with a fire-place containing one or more cylinders in which compressed air or other fluid is expanded. This air afterwards passes through tubes with stop-cocks to the space below the piston of one of two cylinders furnished with proper stop-cocks or valves for the admission and discharge of the hot air. The two piston rods are attached to the opposite ends of a beam with parallel motion radius rods. The stop-cocks are moved by two beams. Each of these is kept down by a catch, but a rod grooved at the upper end, and acted on at the proper time by a pin in the beam supporting the piston rods, liberates the small beam from its catch, and this beam is then pulled down by a spring so as to open the cocks.

[Printed, 8d. Drawings. See Inventors' Advocate, vol. 2, p. 19.]

A.D. 1839, July 3.—N° 8141.

CRUCKSHANKS, ALEXANDER.—This invention consists partly in applying the heat from the combustion of coal tar or other liquid fluid to expand air for the production of motive power. Cold air is pumped into a furnace supplied with liquid fuel, and the heated products of the combustion pass in streams through a perforated slab of baked fire-clay into a reservoir, where they meet a current of cold air, and the whole passes into the working cylinder. The fuel is injected by a syringe worked by the engine. In another arrangement the condensed air in the reservoir is heated by hot air and vapour from the furnace. The condensed hot air passes to the working cylinder, whence part goes to a chamber (above the furnace), and part into a chamber in which the quantity of hot air and vapour are so regulated as to give the proper amount of heat to the air to be heated in the reservoir by passing through tubes to the chimney.

[Printed, 1s. 6d. Drawings. See London Journal (*Newton's*), vol. 20 (*conjoined series*), p. 139; Mechanics' Magazine, vol. 33, p. 241; Inventors' Advocate, vol. 2, p. 131.]

A.D. 1839, August 1.—N° 8184.

LILLIE, SIR JOHN SCOTT.—According to this invention currents of air are produced by the application of jets of steam, or jets of fire, heated smoke and gas issuing from the combustion of fusees filled with suitable compositions in the nature of slow burning gunpowder, such as are used for rockets. The jets are emitted within tubes in a manner similar in principle to that whereby a draught is excited in chimneys of locomotive steam engines. The currents act on pistons, and may be used to exhaust the air before the carriages propelled by a moveable piston in a tube laid along a railway, and to compress the air behind such piston or to exhaust the air in cylinders with double or single-acting pistons, and thus move machinery or to act against floats or vanes on wheels.

[Printed, 6d. No Drawings. See Inventors' Advocate, vol. 2, p. 135.]

A.D. 1839, August 26.—N° 8207.

PINKUS, HENRY.—Motive power is obtained either by partially exhausting the air (by means of a steam engine, water power, or other prime mover), in air-tight mains and pipes laid down in fields, plantations, estates, or along roads, or else by supplying gas for explosive power through such mains and pipes.

The mains are connected with common syphon wells placed at the lowest parts of the estate, and with intersecting valves and gas meters. Vertical branches terminating in cast-iron boxes with valves rise at regular distances from the mains and pipes. Locomotive engines actuated by the motive power convey and impel with them instruments for ploughing, reaping, draining, and other field operations. With the pneumatic auxiliary motive power two piston cylinders with open heads for the free ingress of the atmosphere may be used. A flexible air-tight tube of any desirable length, and capable of being coiled spirally around a cylindrical revolving drum fixed to the engine, connects its vacuum or gas chamber with one of the vertical pipes. The gas engine has double acting gas and air pumps, two piston cylinders connected with two globular explosion chambers having igniting slides and safety valves. Ordinary expanding or metallic conical expanding pistons are used. The latter are solid disks with diameters of, say half an inch less than those of the cylinders, around the rims of which discs a ring of platinum is fixed so as

to form the frustrum of a cone loosely fitting the cylinder. These cones are slit longitudinally in several places, so as to expand, and thin short plates of platinum are made to cover the slits. When the invention is used for propelling on roads or railroads or along canals, mains or valves are laid down so as to allow the engines to take up gas power without stopping. The engine is then provided with a flat pipe or tongue suspended by a ball-and-socket joint, and made so as to form an air-tight joint with the main or valve. The tongue is also furnished with a valve which shuts when it leaves the main or valve. A common railway car on which is a gas receiver is connected as tender to the engine. When the engine is allowed to stop, the mains or valves and tongues may be dispensed with.

[Printed, 4*s*. 2*d*. Drawings. See Inventor's Advocate, vol. 2, p. 195.]

A.D. 1839, November 2.—N° 8250. (* *)

GREENWOOD, David, and PICKERING, William.—" Im-
" provements in engines for obtaining power."

The improved rotatory engine consists of an external cylinder, in which there are two passages or ways, " which can be changed " in respect of their action by proper slides." Connected with the cylinder are two end levers through which the axis of the piston cylinder passes, also stuffing boxes to keep the axis fluid-tight where it passes through the levers, and bearings for the axis carried by the framing of the engine. A piston cylinder is affixed on or framed with the axis, and "there is an opening through " the cylinder in which the sliding levers or surfaces work; the " sliding levers or surfaces are each formed of three angular parts, " by which arrangements, as the outer surfaces wear, the lever " slides are kept fluid-tight." There are springs to press the sliding levers or surfaces outwards, and packing pieces with springs to force them against the sliding levers or surfaces to keep them fluid-tight. Rings of metal are employed to pack the ends of the cylinder, and are kept in contact with the cylinder by means of set screws. " The engine is so arranged as to move its " axle in either direction, according to the position of the slide."

This engine may be actuated by steam or other fluids, " and it " will be found a most powerful engine when acting as a pump " for raising and forcing water and other fluids."

[Printed, 1*s*. 6*d*. Drawings. See Repertory of Arts, vol. 4 (*new series*), p. 1; Inventors' Advocate, vol. 2, p. 195.]

A.D. 1839, November 25.—N° 8282.

SUTTON, JOHN.—In this invention a prime mover is made to act on a crank, and thereby cause a chain to descend, and with it rods which will drag down a shoe lever; this has no sure footing to turn round on, but rests on a wheel beneath, which will recede and turn round the moment it is trod on, causing thereby one end of a balance lever to descend and give an up motion to a crank. Other side levers will be restored to their upright position by the levers of each side of the machine being connected by a counter pulley wheel which will act contrarily, the strap on the pulley wheel rising and descending on contrary sides. In order to multiply motion a cog like wheel, bent, is put on the shaft. A wide slot is made down the middle of each cog to admit of a wheel or roller therein, which work on rollers, wheels, or on cogs.

The second part is for a method of obtaining power by placing a wheel on the top or on each end of the transverse bar of the piston rod. The end of the working beam is made with a slot in it, in which the wheel turns.

The third describes a machine similar to the first described, but more powerful.

[Printed, 10*d.* Drawings. See Repertory of Arts, vol. 14 (*new series*), p. 207; Inventors' Advocate, vol. 2, p. 371.]

A.D. 1839, December 16.—N° 8312.

BRAZILL, JACOB.—"Motive power" is obtained by a large drum furnished with any number of radial plates or fans set round a boss. Some "are so arranged as to slope down-" wards towards the bottom plate, thus forming as it were " a series of boxes decreasing in their transverse diameters as " they approach the boss, the object of which is that as the drum " revolves it shall acquire the greater degree of centrifugal force " by the weight being thrown upon the outer parts." The drum is given a rotatory motion by currents of air impelled through pipes against the fans. The air is supplied either by a blowing machine or weighted double bellows worked by cranks connected with the drum.

[Printed, 10*d.* Drawing. See Inventors' Advocate, vol. 2, p. 419.]

A.D. 1840, February 8.—N° 8381.

F— EDMUND, jun.—Motive power is obtained either from ders open at the top to the atmosphere, or from two

such cylinders. Three are preferred; when used they work a three throw crank, which obviates the necessity of a fly wheel. A steam boiler is necessary to admit steam to the bottom of the cylinder, by the condensation of which beneath the pistons the pressure of the atmosphere is brought into play. The power of the engine arises from the preponderating pressure of the air on the outsides of the pistons one after another as the steam is alternately condensed and admitted, so that the engine may be regarded as an air or atmospheric engine, though materially differing from every engine heretofore known by that appellation. As an additional power may be desirable for occasional use, such power is provided by compressed air obtained and applied by a supplementary apparatus consisting of a larger and a smaller cylinder and two air condensing pumps. The piston rod of the larger cylinder has a T head and two guide rods, and a screw inserted in its centre for drawing in the piston. The pumps are worked by a small crank attached to the main crank. A second crank in connection with the piston of the smaller cylinder renders the compressed air in the two cylinders available for working purposes.

[Printed, 1*s*. 8*d*. Drawings. See Mechanics' Magazine, vol. 33, p. 220; Inventors' Advocate, vol. 3, p. 115; Engineers' and Architects' Journal, vol. 3, p. 364.]

A.D. 1840, April 13—N° 8467.

BAINBRIDGE, EDWARD THOMAS.—Motive power is obtained from the accumulated force of a body in motion caused by the rush of the atmosphere into vacuum, or by that and gravitation.

The engine described has a vertical cylinder with a vacuum below an air-tight piston. The piston rod has a series of holes, or a rack formed in it, by which and the action of a toothed wheel the piston is raised. Part of the wheel is without teeth to allow the rod to go free when raised to its greatest elevation. The rod is connected with a cranked lever which moves freely on the main axis, and is connected to it by links; and on the upper end of the rod is a second small cylinder open at the lower end, which just before the completion of the stroke receives a piston formed on the upper surface of a block. The air is thus compressed in the second cylinder, which both modifies the shock that would otherwise be caused by the descending piston, and also aids it to rise. At the upper end of the cranked lever is

attached a driver which takes into the teeth of a ratchet wheel affixed on the main shaft. A stop prevents the lever going too far back. When the piston is raised to its full height the lever falls back by its own weight. Several pistons may be made to work the same axis.

[Printed, 10*d*. Drawing. See Repertory of Arts, vol. 15 (*new series*), p. 17; Mechanics' Magazine, vol. 33, p. 445; Inventors' Advocate, vol. 3, p. 259.]

A.D. 1840, April 15.—N° 8474. (* *)

WILLIAMS, THOMAS ROBINSON.—" Improvements in obtaining " power from steam and other elastic vapours or fluids, and for " the means employed in generating such vapours or fluids, and " also for using these improvements in conjunction with dis-" tillation or evaporation and other useful purposes."

Advantage is taken of the currents of steam in their passage from the boiler to the cylinder of a steam engine to obtain additional power by forming a cylindrical chamber in the top of the boiler, having about two-thirds the capacity of the engine cylinder. This chamber communicates with the boiler through narrow slits in the circumference of the cylinder at its bottom, made in a slanting direction, nearly tangential to the periphery of a wheel, which has cycloidal detent teeth, or floats, on its periphery. The axle of the wheel, which revolves at the bottom and passes through the roof of the cylindrical chamber, carries a bevelled pinion that takes into a wheel on the main shaft. The steam from the boiler passes through the slits and impinges with great velocity upon the detents or floats of the wheel before it reaches the steam cylinder; and the additional power thus gained is transmitted by the bevelled wheels to the machinery.

The above-described arrangements of machinery are also applied as a separate engine by allowing the steam to pass off freely after imparting its power to the wheel; or the apparatus may be placed between a still head and condensing worm; or a spiral screw fan or valves may be fixed upon the axle of the cylinder.

[Printed, 10*d*. Drawings. See Repertory of Arts (*new series*), vol. 16, p. 328; London Journal (*Newton's conjoined series*), vol. 19, p. 158; Inventors' Advocate, vol. 3, p. 261.]

A.D. 1840, June 11—N° 8541.

LANCE, WILLIAM.—This invention consists, in the first place, of improvements in and additions to the harpoon used in the *whale fishery*.

Secondly, in a manner of throwing such instrument by a gun or tube having a reservoir of highly compressed air. The air is compressed by forcing water by an ordinary hydraulic pump from a well or chamber into a cylinder, having a valve at the top through which the air passes into the reservoir, and also provided with a cock at the top for admitting air, and at the bottom for the egress of the water.

And, thirdly, in the use of air highly compressed by the before-mentioned process, and which may be "supplied to the cylinder "for working the piston (as is usual with high pressure steam "engines) after passing through a coil of tubing immersed in any "substance which by the application of heat will increase its "elasticity, or it may be supplied direct from the vessel to the "cylinder."

The third head of the invention has also reference to the application of a fly or set of fans immersed in a running stream, and so made to revolve and communicate motion. The pumps used in condensing air may be thus worked.

[Printed, 10d. Drawings. See London Journal (*Newton's*), vol. 25 (*conjoined series*), p. 162; Mechanics' Magazine, vol. 33, p. 590; Inventors' Advocate, vol. 4, p. 35.]

A.D. 1840, August 5.—N° 8591.

MACRAE, COLIN.—(*A communication from M. Degrand and another.*)—This consists first in improvements upon Degrand's former invention, No. 7903, p. 83. These are giving the curled pipes of the two wheels contrary directions of spiral convolution, and enclosing the wheels in different compartments of the case or box. In one of the compartments a plenum and in the other a relative vacuum is kept up. The mercury or other heavy fluid is forced by the plenum into the first wheel and reaches the second by its hollow axis, and is discharged into the second compartment. There is an open communication through the lowest part of the partition through which the mercury can pass back to the first compartment. The plenum may be maintained by means of steam, compressed smoke, gases, or heated air, or a mixture of steam and the others. Two or more of such rotary engines may be combined to form a series to be worked by the same elastic fluid passing in succession from one to the other, the fluid being thus made to expand gradually. Secondly, in a rotary engine similar to the one first described but of much stronger force, the communication

between the compartments being made not through a partition but by vertical pipes communicating with each other at the top. Into one of the pipes a jet of steam or elastic fluid is discharged which forces the mercury or heavy fluid upwards and thus into the pipe leading to the second compartment, and thus produces a comparative vacuum in the first compartment. Thirdly, in a revolving engine formed of one curled pipe with a vertical hollow axis, which is made to revolve by a heavy liquid descending through the axis from an upper reservoir. The liquid is again forced into the upper compartment by the action of steam, compressed smoke, gases, or heated air within the case containing the wheel.

[Printed, 2*s*. Drawings. See Inventors' Advocate, vol. 4, p. 99.]

A.D. 1840, September 10.—N° 8628.

GILBERT, GEORGE ALEXANDER. — By this invention tubes sliding within one another and called telescope tubes are substituted for the cylinder in the construction of engines actuated by steam, air, gas, or other elastic fluid. There are two tubes, one end of each of which is bolted to a steam box or chamber divided in the middle into two compartments. These tubes slide on stationary tubes affixed to the framework. Steam is admitted alternately into the two stationary tubes by pipes furnished with valves and opening into the fixed extremities of the tubes, and escapes by other pipes opening close to the openings of the first set. By this means a reciprocating movement is given to the steam box which is converted into a rotatory motion by connecting rods attached to the crank of the main shaft.

[Printed, 6*d*. Drawing. See Repertory of Arts, vol. 16 (*new series*), p. 4; London Journal (*Newton's*), vol. 19 (*conjoined series*), p. 167; Mechanics' Magazine, vol. 34, p. 238; Inventors' Advocate, vol. 4, p. 183.]

A.D. 1840, October 1.—N° 8650. (* *)

TALBOT, WILLIAM HENRY FOX.—" Improvements in producing " or obtaining motive power " by means of galvanic electricity.

In one engine, the galvanic current is made alternately to generate the mixed gases from the decomposition of water under a piston, and to explode those gases, thus giving motion to a fly-wheel shaft.

A second engine is described, which being entirely electro-

magnetic in its action, requires no description in the present series.

In a third engine, motive power is obtained by the alternate expansion and contraction of a gas, vapour, or fluid, heat being applied and withdrawn at proper intervals by a galvanic battery. A strong iron U-shaped tube, partially filled with mercury, has one leg in connection with a piston, the other leg closed at the end and filled with solid carbonic acid; this soon liquefies, a part becomes gaseous, and motion of the piston is produced by passing a galvanic current, at proper intervals, through a thin piece of metal (thus heating it) in the carbonic acid.

[Printed, 8*d.* Drawing. See Repertory of Arts, vol. 16 (*new series*), p. 35; Mechanics' Magazine, vol. 34, p. 319; and Inventors' Advocate, vol. 4, p. 230.]

A.D. 1840, October 1.—N° 8652.

STIRLING, JAMES, and STIRLING, ROBERT.—" Air engines." The driver which displaces the air from the hot to the cold end of the air vessels is made air tight, " having a quantity of pounded " bricks or other imperfectly conducting substance introduced " into its lower part, and the remainder divided into 12 or 16 " compartments by thin plates of iron kept at equal distances " from one other." The air is driven through a plate box of which two-thirds are filled with plates of sheet iron, the greater part of which are about one-fortieth of an inch in thickness. The remainder is occupied partly by a cooling apparatus in which cold water is made to circulate, and partly by blocks of iron, glass, or other solid bodies. Sometimes the air is made to pass through the driver, a great part of which is in such case filled with alternate sheets of plain and fluted glass divided into narrow strips. The air afterwards passes through the cooling apparatus to the cold end of the vessel. The plates of glass should be placed so as to make the passage for the air parallel or nearly so with the axis of the driver. The pipe to the working cylinder is so placed that the air must pass through the cooling apparatus before reaching the cylinder. Cupped leather collars which communicate with the interior of the engine are used around the piston and other rods.

[Printed, 10*d.* Drawing. See London Journal (*Newton's*), vol. 42 (*conjoined series*), p. 213; Mechanics' Magazine, vol. 34, p. 318, and vol. 45, p. 559; Inventors' Advocate, vol. 4, p. 230.]

A.D. 1840, October 15.—N° 8661.

NEWTON, William.—(*A communication.*)—This consists of improvements upon the engines A.D. 1839, No. 7941. The essential arrangements for working the engine profitably are first that the surfaces against which the air comes in contact shall be as much enlarged as possible; secondly, that the temperatures to which the air or gas shall be raised or reduced shall be certain and uniform; thirdly, employing the same uniform quantity of air or gas, and lastly, that all contact between the hot air or gas and the working piston should be avoided. Two engines constructed on these principles are described. The first is of low pressure, with a generator heated at the bottom, and containing the working piston, which is of a conical form, and is cooled by a circulation of cold water at the top. The displacing vessel has its upper part fitted to receive the working piston, and filled with charcoal or other bad conductor. The lower part is fitted with asbestos. The air passes between this vessel and the sides of the generator from the hot end to the space between the piston and displacing vessel, when they are apart, and is there cooled. In the high pressure engine the displacing vessel moves horizontally. The working piston is contained in the generator at the cool end. The air within the displacing vessel is made to communicate with the space at the back of the piston by a pipe passing through a cooling apparatus. Cold water may be injected into the space between the piston and displacing vessel, when the latter is at the hot end of the generator.

[Printed, 2*s*. 2*d*. Drawings. See Mechanics' Magazine, vol. 34, p. 349; Inventors' Advocate, vol. 4, p. 262.]

A.D. 1841, January 4.—N° 8771.

GOLIGHTLY, Charles.—"A new apparatus for obtaining "motive power."

[No Specification enrolled.]

A.D. 1841, February 8.—N° 8841.

JOHNSON, James.—Motive power is obtained from the explosion of oxygen and hydrogen mixed in the proportions which form water, and the power is derived both from the explosion itself and also from the vacuum caused by the formation of water. The differences between these gas engines and steam engines are first

that the cylinder in the former has a receptacle formed at each end to receive the gas required for one stroke of the piston, and to enable the valve to be closed during the explosion, and secondly that the eccentric working the rod which opens the valves is placed on a distinct shaft placed near the shaft of the flywheel, and connected with it by a toothed wheel on the eccentric shaft, and a segment of a large toothed wheel on the shaft of the fly-wheel. This segment carries the same number of teeth as the wheel on the eccentric shaft. The valves are consequently to be opened and shut at any required time during the stroke of the piston. This part of the invention however is not claimed.

[Printed, 4*d*. No Drawings. See Repertory of Arts, vol. 16 (*new series*), p. 175; London Journal (*Newton's*), vol. 21 (*conjoined series*), p. 450; Mechanics' Magazine, vol. 35, p. 176; Inventors' Advocate, vol. 5, p. 99.]

A.D. 1841, May 22.—N° 8963.

WOODS, JOSEPH.—Rotary engine. The revolving parts consist of an axle passing through a circular disc plate and ball called the diaphragm, firmly fixed on the main shaft. A piston, oscillating towards each end in a line with the main axle, passes through a slot hole in the diaphragm, and is attached to the disc plate. A channel passes downward from each side of the slot, extends through the ball, and emerging continues as a channel to the admission and exhaustion chambers respectively. The stationary parts are two conical surfaces enclosed in a spherical case. A portion of each side is perpendicular to the axle of the machine, and in contact with the revolving diaphragm on opposite sides of its substance and of the axle. The apex of the cone is removed and fitted to the centre ball. The cones are hollowed out to form chambers for the admission and dispersion of the steam or other fluid. The oscillating piston is of the form of a section of the entire space at right angles to the diaphragm, and is made to slide over the sides of each cone, as the space on either side of the piston increases or decreases. The actuating fluid enters by the channel and impinges on the piston (except when used expansively) throughout the entire revolution of the piston diaphragm and axle, which all move simultaneously. Just before the piston passes before the culminating line of contact of the diaphragm and cone, the exhausted fluid becomes liberated, and passes into a condenser or elsewhere, whereby one side of the piston

is constantly exposed to the pressure and its opposite side to the vacuum or atmosphere.

[Printed, 1s. 8d. Drawings. See Mechanics' Magazine, vol. 35, p. 489; Artizan, vol. 3, p. 42; Inventors' Advocate, vol. 5, p. 357.]

A.D. 1841, June 23.—N° 9004.

BERRY, MILES.—(*A communication.*) This consists of an engine driven by the gases produced from the combustion of a composition consisting of "two parts of pure saltpetre, sixteen "parts of sulphur, and twelve parts of wood charcoal." A metallic tube or cartouch is loaded with this substance which is then ignited by a needle bearing a small wad of prepared tinder and then lowered quickly into a tank of water. The elastic gases generated are made to pass into a reservoir and thence alternately into each of two horizontal cylinders whose pistons are connected to the same rod. "When the combustible "matter of the cartouch is entirely consumed it must be raised "out of the water and replaced by another.

[Printed, 10d. Drawing.]

A.D. 1841, July 13.—N° 9027. (* *)

BEALE, BENJAMIN.—Rotary engine to be worked by steam, water, gas, or vapours. The outer cylinder is fixed; a hollow cylinder, or drum revolves on an axle eccentrically within it so as to cause a part of the drum to slide in steam-tight contact against the concave face of the cylinder, and form a steam chamber of a crescent form. Longitudinal recesses are made in the drum, in which are placed loose rollers, or "cylindrical "pistons" without axles, and perfectly flat on their ends, which slide steam tight over the face of the end plates. The revolution of the drum causes the cylidrical pistons to fall by their gravity more or less out of their longitudinal recesses against the face of the drum, they are also thrown outward by the centrifugal action, and pressed by the steam into sliding contact with the concave surface of the cylinder. The steam from the induction pipe passes into the space between the line of contact of the drum and concave cylinder on one side, and escapes, after carrying the drum round through a passage at the opposite point of the diameter. The axle of the drum revolves on a series of small antifriction rollers without axles or centre bearings placed nearly in contact round the main shaft.

Instead of the rollers forming steam stops, pistons sliding out of and into recesses in the drum are substituted, which are kept in contact with the concave cylinder by cams or eccentrics.

[Printed, 10*d*. Drawings. See London Journal (*Newton's conjoined series*), vol. 20, p. 417. Mechanics' Magazine, vol. 39, p. 321. Engineers' and Architects' Journal, vol. 5, p. 181. Transactions of the Society of Arts, vol. 54, p. 200.]

A.D. 1841, September 17.—N° 9085.

STOLLMEYER, CONRAD FREDERICK.—(*A communication.*)—The principal features are, first, to effect all the works for shifting the sails and other stated purposes by a windmill at the stern of the vessel. Secondly, to simplify the sail system by substituting for the ordinary sails a sort of fan to be expanded or contracted to any portion of its surface, and to be turned around a mast as on a pivot: the windmill is connected with the fan by ropes, wound off and on vertical spindles, which are provided with toothed wheels that can be brought to be acted on by the teeth of a wheel on the wind shaft: the fan is constructed with concentric arches, between which the ribs of the sails slide, the inner arches holding the pivots of the ribs, the outer one serving to support and help to extend the sails. Thirdly, the windmill may be applied to weigh anchors, lift goods, pump water, and perform other operations. Fourthly, in using the action of the waves on vessels as floats to produce rotatory motion which may be applied to propel the ship and other purposes.

[Printed, 2*s*. Drawings. See Inventors' Advocate, vol. 5, p. 330.]

A.D. 1841, October 14.—N° 9118. (* *)

NEWTON, WILLIAM.—(*A communication.*)—" Improvements " in engines to be worked by gas, vapour, or steam."

This Invention consists, first, in using the elastic force of the gas vapour arising from "ether or volatile liquors" heated by means of hot water, to produce motive power. The engine used is constructed as follows:—The boiler is cylindrical and horizontal, and has a cylindrical fire chamber and its flue carried through it and surrounded with water. A second boiler nearly semi-cylindrical, filled with water, and containing a number of horizontal small tubes, in which the volatile agents (sulphuric or hydrochloric ether, or ammoniacal gas,) are placed is set within the first boiler and over the furnace, and surrounded with

water. A pipe connects these tubes with a piston cylinder, which is placed within the first boiler, and immersed in its water and steam. Another pipe connects the cylinder with a condenser, which is composed of a chamber filled with cold water and enclosing a number of small horizontal pipes that communicate with a chamber or pipe at the lowest point of the apparatus. The water in the first boiler is heated by the gases from the furnace and in the flue; this water heats the water in the second boiler, and converts the volatile substance in the small pipes that run through into vapour, which flows through a pipe into the working cylinder, and gives motion to the piston. The used gas is then conveyed into the condenser pipes, immersed in cold water, wherein it circulates, and is cooled by contact with the cold surface of the pipe, and falls as a fluid into a chamber at the lowest point of the apparatus, from which it is pumped and introduced again into the pipes in the inner boiler, to be vaporized and conducted into the working cylinder.

The facility with which ether and volatile liquids are connected into vapour by heat, render it dangerous to expose the surface of a vessel containing them to the direct action of fire. Water is, therefore, interposed between the inflammable substance and fire-heated surfaces, and precautions taken to prevent the escape of the volatile substance in its gaseous or fluid form, at joints and openings.

Second, relates to an improved stuffing box to be used in such engines, and consists in surrounding the usual stuffing box of the piston or other moving rod with a small chamber, through an opening in the lid of which the rod passes, the opening being provided also with a stuffing box. The space left between is filled with oil at a considerable pressure by means of a force pump, and conical pieces wrapped round with leather are added to the stuffing boxes so as effectually to prevent leakage of the volatile vapour.

The cylinder may be oiled from this chamber by a valve contained within the chamber, but worked from the outside by a handle attached to an axis which passes through the side of the chamber. The spindles of valves or cocks used to confine volatile vapours may also be provided with the improved oil chamber stuffing box.

[Printed, 1*s*. See Mechanics' Magazine, vol. 36, p. 332.]

A.D. 1841, November 2.—N° 9132.

HOLT, ROBERT, and JACKSON, ROBINSON.—Rotary engine. The cylinder is elliptical, the piston is also elliptical, and tightly packed at its ends and sides. A shaft passes through a mortice formed entirely through the piston, and is supported on bearings on each side of the machine. Upon the shaft are two carrier pieces, in which are mounted friction rollers. The piston is forced round by steam or other elastic vapour fluid, which enters by one pipe into the cylinder, and is discharged by a pipe at the opposite side. Another modification has two moveable elliptical pistons working at right angles to each other, the ends of one working in gearing into the sides of the other alternately. The pistons are coupled by means of spur wheels, and are driven round by steam or other elastic vapour acting against the piston which is in the vertical position.

[Printed, 1s. Drawings.]

A.D. 1842, February 9.—N° 9251. (* *)

BAGGS, ISHAM.—" Improvements in obtaining motive power by " means of carbonic acid, and also by a peculiar application of " heated air." These are, the mode of working, in a suitable engine, "whereby carbonic acid in the form of gas is evolved " and used as a means of pressure to obtain motive power, " and then absorbed, and the matters used for evolving and " absorbing the gas are used over and over again." There are two vessels containing respectively solutions of " super-sulphate " of ammonia and carbonate of ammonia," and these solutions are by means of pumps introduced into a vessel " in proper quantities in relation to each other, so as " to evolve the whole of the " carbonic acid contained in the carbonate of ammonia." The gas thus evolved is made to pass off through a pipe to a suitable cylinder or engine having a piston and piston rod; but the inventor does not describe the engine. The tube conveying the gas to the engine is coiled, and is made to pass through a vessel containing ammonia, at the bottom of which a tube delivers the carbonic acid from the eduction way of the cylinder of the engine; any carbonic acid gas not absorbed will pass by a tube to the bottom of another vessel containing ammonia. The liquors in these vessels are converted into carbonate of ammonia, and are from time to time drawn into one of the first two vessels by a

pipe. The pipes or vessels are to be kept supplied with a solution of ammonia, in order to take up the carbonic acid as it comes from the eduction way of the engine by a pipe leading from a receiver, into which ammonia is brought by a retort distilling the sulphate of ammonia from the vessel into which the super-sulphate of ammonia and carbonate of ammonia were pumped. The remaining matter in the still is super-sulphate of ammonia, which may be drawn off into one of the first two vessels.

By a Disclaimer granted August 9th, 1842, the following words occurring in the title, "and also by a peculiar application of heated " air," are disclaimed.

[Printed, 8*d*. Drawing. See Repertory of Arts, vol. 18 (*new series*), p. 328; London Journal (*Newton's*), vol. 23 (*conjoined series*), p. 8; Mechanics' Magazine, vol. 37, p. 433; Record of Patent Inventions, vol. 1, p. 16.]

A.D. 1842, April 15.—N° 9321. (* *)

LAMB, JOHN.—" Improvements in engines to be worked by " steam, air, gas, or vapours; which improvements are also " applicable to pumps for raising or forcing water, air, or other " fluids."

The outer cylinder is fixed; the inner cylinder revolves eccentrically round the main shaft, which is enlarged in diameter at that part within the cylinder. In revolving, the outer surface of the eccentric cylinder bears against the inner surface of the outer cylinder, and the concave surface of the eccentric cylinder is maintained closely against the collar which surrounds the mainshaft. The lines of contact of these surfaces form steam-tight joints of separation, between the steam and vacuum spaces. The stationary steam stop is fixed to the outer cylinder and collar, and has the induction passage on one side, and the eduction passage on the opposite side. The entering steam exerts its elastic power against the immovable stop, the collar, and inside of the eccentric cylinder; and causes the latter to recede, by which a space is formed between the outside of that cylinder and inside of the outer cylinder, their line of contact separating the spaces on each side of it.

A modification of the engine has an arrangement for working the engine expansively. The steam having exerted its elastic power in the engine passes therefrom into another engine of enlarged capacity and thence into the condensing apparatus.

A like arrangement of apparatus will serve as a pump for raising

or forcing water, air, or other fluids, rotary motion being communicated to the shaft by any convenient means.

[Printed, 1*s*. Drawings. See Repertory of Arts (*enlarged series*), vol. 1, p. 98. London Journal (*Newton's conjoined series*), vol. 21, p. 350. Mechanics' Magazine, vol. 37, p. 415. Record of Patent Inventions, vol. 1, p. 185.]

A.D. 1842, May 23.—N° 9354.

PILBROW, James.—Improvements in steam engines. These consist partly in using the steam to turn a wheel revolving within a case. Cavities are made within, or attached to the inside circumference of, the case for the purpose of receiving the used steam and returning it into the cavities of the steam wheel, at the same angle as that at which the steam originally issued from the jet pipes. The periphery of the wheel is formed all round of cavities of the same dimensions, which must be set at such angle to its circumference as will permit the steam to reissue therefrom in the opposite direction to its entrance without striking against the back of the cavity next in succession. By the peculiar direction of the injet of steam and its clear reissue, the effect obtained is about double that of its mere impact against a vane or flat surface, for all the velocity of motion of steam is thus arrested, and by this application of it turned back and the power required to change the direction of the steam is received in the cavities of the wheel which will revolve with all the available power of the steam and the extreme duty from expansion.

[Printed, 2*s*. 2*d*. Drawings. See Mechanics' Magazine, vol. 38, p. 239 Record of Patent Inventions, vol. 1, p. 300; Artizan, vol. 1, p. 113.]

A.D. 1842, July 12.—N° 9419.

STUCKEY, William Henry. — Pneumatic engine. Two horizontal cylinders united at their inner extremities rotate on gudgeons. Each cylinder has a piston and communicates with two hollow arms radiating in opposite directions perpendicular to the cylinder. The four arms terminate in cylinders affixed to a circular wing open at the other extremity to the air, and furnished with pistons fixed to a circular wing. Mercury is poured down one of the arms when vertical, and flows into the cylinder from which the arm radiates, pressing the piston forward to the extremity of its range which is that point where it comes into contact with the mouth of the under tube. The wheel is then turned till the other

arms are vertical, whereby the mercury is forced into the tube lately the under tube, down which it flows driving the piston of the cylinder at the end of the tube to the extremity of its range, and leaving a vacuum in the central cylinder equal to the difference between the heights from which the mercury descends in the tubes. Mercury is introduced in the same way into the other cylinder and tubes. Weights are attached to the piston rods of the outer cylinders, which, by means of boards and pullies, transfers the excess of weight at the bottom of the lower tube to the top piston, where it acts in aid of the atmospheric pressure in giving rotation to the wheel.

[Printed, 1*s*. 6*d*. Drawings. See Record of Patent Inventions, vol. 1, p. 470.]

A.D. 1842, December 22.—N° 9567.

VAILE, Henry Purser.—"Improvements in combining me-"chanical instruments for obtaining power."

[No Specification enrolled.]

A.D. 1843, January 26.—N° 9609.

GREENSTREET, William James.—"Certain improvements "in machinery or apparatus for producing or obtaining motive "power."

[No Specification enrolled.]

A.D. 1843, March 7.—N° 9658.

PILBROW, James.—This consists, first, in improvements on the steam wheel, the subject of the Patent N° 9354, p. 101, whether the wheel be moved by steam, air, vapour, or other gaseous agents. The cavities are formed of curves or angles, and go round the circumference of the wheel with mouths for the entrance of the steam inside the wheel inclined to the nozzle with an exit for the steam on the outside of the periphery. Part of the case has a few cavities opposite to the point where the steam is injected to receive the used steam and turn it in the direction of the wheel. Propellers, vanes, or screws are used to apply the velocity of the wheel to move vessels or locomotive carriages. These may be placed on a truck in front of the engine, in which arrangement a steam pipe with a universal joint, constructed of elbow joints, and three stuffing boxes may be required. The propeller may also be made itself to form the discs or spokes which would

otherwise be required to support the rim of the revolving cavities. The section of a flat hoop is attached to the edge of the vanes to prevent cold air getting into the hollow ring. When extreme velocity is not required two steam wheels are made which revolve side by side, the periphery of each being formed of two or more rows of cavities or curves curved in opposite directions, and made to overlap and revolve in opposite directions. The steam will first be projected into the curves in one wheel, and then being reflected back will be injected downwards into the curves on the other wheel.

The invention consists, lastly, in an arrangement of metal discs in substitution of the cylinders and pistons of steam engines. A number of circular discs, each with a hole in the centre, are joined in pairs to each other at the circumference, each pair being joined to the next round the central hole, which is left free for the steam. The lower disc is firmly attached to a thicker plate of metal, which can oscillate by arms moving in bearings, and the upper to a similar plate attached by a rod to a crank. Steam or other gas being admitted the discs will be separated by its expansive force, and will on the valve shifting collapse.

[Printed, 1*s*. Drawings.]

A.D. 1843, July 13.—N° 9840.

NEVILLE, JAMES.—Gases for obtaining motive power are obtained from "the rough nitrates of potash or soda, combined with "charcoal, bituminous coal, or other carbonaceous or combustible "matter" mixed in such proportions as completely to decompose the nitric acid of the nitrates by combining with the oxygen. The mixed matters are introduced by means of three pistons into a cylinder of wrought iron, the lower part of which contains a flue from a furnace. The cylinder is provided with a casing, the lower part of which is filled with water. The mixed matters pass down a tube in the centre of the cylinder, and the gases formed by their combustion are made to pass down through the water in the casing, and to convert a great part of it into steam, which with the gases passes off by a tube at the top of the casing to act on the working cylinder. "The residuum of the nitrates em-"ployed, viz., the sub-carbonate of potass or soda will nearly "repay the original cost of new materials."

[Printed, 10*d*. Drawing. See Repertory of Arts, vol. 3 (enlarged series), p. 151; Engineers' and Architects' Journal, vol. 7, p. 61.]

A.D. 1843, August 15.—N° 9867.

YOUNG, THOMAS.—" Improvements in obtaining power."

[No Specification enrolled.]

A.D. 1843, November 9.—N° 9937.

HASELTINE, SAMUEL, junior.—This is an improvement in the engines, A.D. 1839, N° 7941, and A.D. 1840, N° 8661, pp. 83, 94. The engine is furnished with two generators, each having a cylindrical plunger provided with a conical recess at each end, the lower recess to fit the bottom of the generator, and the upper to fit the piston. The plungers are held by rods connected by means of chains passing over a wheel with a cam on the crank shaft.

The particular features of novely claimed are,—

" First, the employment of a piston or pistons, made hollow " and closed at the top, through which a continual current of " cold water is passed."

" Secondly, grooving the interior of the cylinder for the passage " of the air from the upper to the lower part of the cylinder and " vice versâ."

[Printed, 1s. 4d. Drawings.]

A.D. 1843, November 16.—N° 9945.

REINAGLE, RAMSAY RICHARD.—" Certain improvements in " applying atmospheric air as a motive power."

[No Specification enrolled.]

A.D. 1843, December 5.—N° 9972.

ROBINSON, JOSEPH.—(*A communication.*)—This invention consists in an engine driven by inflamable gas or vapour. It is provided with a reservoir where the spirits of turpentine, naptha, or other liquid whose vapour is employed is contained and a retort in which portions of the liquid are evaporated and into which atmospheric air is driven by a double-acting pump. The mixed air and vapour pass through the valve box to one end of a double-acting cylinder, in which the pressure is regulated so as slightly to transcend that of the atmosphere. At each end of the cylinder is an opening, closed by a valve, and nearly in contact with it is the flame of a lamp. The valve is opened when the piston has made about one-eighth of its stroke,

and there is then a momentary jet of the inflamable mixture outwards, followed as the piston travels on by an immediate draught inwards. The ignition is thus effected. The retort is warmed after the engine is in operation by the hot air discharged from the cylinder, or by being placed near the cylinder. Carburetted hydrogen may be substituted wherever there are gas works.

[Printed, 10*d.* Drawings. See Repertory of Arts, vol. 4 (*enlarged series*), p. 129; London Journal (*Newton's*), vol. 26 (*conjoined series*), p. 24; Engineers' and Architects' Journal, vol. 7, p. 240.]

A.D. 1844, February 8.—N° 10,045.

NEWTON, WILLIAM EDWARD.—(*A communication from Monsieur Hallette.*)—Propelling on railways and water. Part of the invention is applicable to the construction of a rotary engine to be worked by steam or other elastic fluid. It has an annular cylinder formed of two semi-cylindrical pieces bolted together. A piston works in circular air-tight grooves made all round the inner surface of the cylinder, and each furnished with flexible tubes or lips inflated with compressed air or other suitable fluid or liquid. The steam stop is formed by a clack valve mounted on a hinge which can be forced into a recess fitted for it when the piston passes it. An eccentric on the main shaft works a slide valve in the valve box, and so regulates the amount of steam allowed to enter. The steam may be cut off when the piston has passed one-third of a revolution.

[Printed, 4*s.* 2*d.* Drawings.]

A.D. 1844, March 14.—N° 10,108.

WHARTON, EMANUEL.—This consists, first, in metallic packing for steam engine pistons, also applicable to gas and air engines made by four equal segments, forming with wedges inserted between them one circular ring. The inner faces of the segments are level or conical. A metal-ring cut through at one part, so as to allow it to expand or contract, is fitted by adjusting screws to the conical faces. Secondly, in metallic packing for patent disc engines. A metallic ring with a small portion of hemp interposed serves as the front packing of the ball of the disc, and is fitted on the gland which is bolted on the cone. Three springs bolted to the cone above the gland, press on three projecting parts of the ring so as to allow it a little play. The springs may be tightened by screws. The packing for the back cone is very

similar, but has a square on the ring to receive a key to turn the ring partly round each day, and a pin for locking the ring when the engine is in action.

[Printed, 10*d*. Drawings. See Mechanics' Magazine, vol. 41, p. 225; Engineers' and Architects' Journal, vol, 7, p. 370.]

A.D. 1844, June 4.—N° 10,212.

PHILLIPS, WILLIAM HENRY.—According to this invention gas is generated in large quantities from cakes made of powdered charcoal, saltpetre, and plaster of Paris, or of the other substances mentioned, and is employed to extinguish fires, and for other purposes. Among these, are forcing out water from a tank upon a burning mass; obtaining motive power; and propelling a vessel by the pressure of the gas rushing through pipes on the water. To obtain motive power, the gas is made to enter an annular space between two wheels. The outer wheel is toothed and has three pistons fixed to it by the pressure of the gas on which this wheel is driven round. The inner wheel has two hinged or jointed valves usually kept open by springs, but giving way to allow the pistons to pass. The inlet pipes are placed so as to be closed by the valves when forced back by the pistons.

[Printed, 2*s*. 8*d*. Drawings.]

A.D. 1844, June 21.—N° 10,232.

FONTAINEMOREAU, PIERRE ARMAND LE COMTE DE.—(*A communication.*) — Locomotive engines, either reciprocating or rotary, are put in motion by compressed or rarified air supplied by a tube placed in the direction of the railway. The tube has at certain distances orifices closed by ordinary valves opened by pressing on a hammer. Above the tube are fixed distributing boxes having a single orifice at the bottom above the valve of the tube, and a number of similar valves with hammers at the upper part. Above the box is a groove protected on one side by a strip of sheet iron, and on the other by a leather strip. Into this groove a kind of slide hollow underneath glides, and is drawn conjointly with the locomotive. The slide opens the valves as it passes over them, and is of such a shape that in passing through the groove it causes the leather to open and shut by itself when the slide has passed. To the top of the slide is fastened an eduction pipe, to which a second pipe with an elastic part, either of leather or caoutchouc, is fastened.

[Printed, 1s. Drawing.]

A.D. 1844, July 17.—N° 10,263.

BIDAULT, JACQUES.—(*A communication.*)—Gas obtained from distillation of coal or other material is combined with air, inflamed, and applied to the generating of steam and for other purposes, and also to obtain power to drive machinery. The coal is distilled in three metal retorts communicating with each other, and is heated by a coke furnace. The fire-place is hermetically sealed and closed by screws in a similar manner to the ordinary gas retorts. It is supplied with air by a double blowing apparatus. The distilled gas pass through tubes to three chambers in which the mixture of the gas and air takes place. Three air cylinders, supplied with air by any convenient apparatus through a branch tube, also communicate with the chambers. The chambers in which the mixture takes place pass through the water chambers, and are connected by branch pipes which run up to the upper part of the boiler, where is a valve through which the air and inflammable gas would escape with the steam from the boiler. The mixture is ignited by a gas burner, or in preference by a stream of hydrogen produced by causing a vessel filled with bits of zinc to descend into a mixture of sulphuric acid and water, and afterwards ignited by spongy platinum. When the gas is lighted "the heat is given off to the water in the boiler and " generates steam and passes off into the steam, and is employed " by connecting it with suitable machinery to obtain power. The " pressure of the injected air through the furnace must always " exceed the pressure of the power obtained."

[Printed, 8*d.* Drawing. See Repertory of Arts, vol. 3 (*enlarged series*), p. 310.]

A.D. 1844, October 17.—N° 10,352.

PARSEY, ARTHUR.—A receiver is filled with compressed air either by an air pump or from vessels previously filled. The air passes from the receiver to a chamber where its density is reduced and its elastic force regulated by means of a spring valve orby a governor or otherwise. From the chamber or from the receiver directly the air passes to the valve box in which is a slide valve moved by its rod. The slide valve is formed of a rectangular frame with two plates grooved flat to fit air tight against the inner side of the valve box, against which they are forced by springs. The air acts alternately on the sides of a piston, and afterwards

either escapes or is drawn back into the receiver by two air pumps contained within it and communicating respectively with either end of the working cylinder by pipes furnished with a series of valves which prevent the air passing from the receiver to the cylinder, and are placed at unequal distances, so that the capacity of the chamber may increase towards the cylinder. Each air pump consists of a solid block perforated by the tube from the cylinder and furnished with a moveable cap in which is a valve. The caps are moved by means of a beam worked by hand or by a steam engine or otherwise.

[Printed, 10*d.* Drawing. See Engineers' and Architects' Journal, vol. 8, p. 298, vol. 9, p. 107.]

A.D. 1844, November 25.—N° 10,404.

REYNOLDS, John William Buckle.—"Gas or pneumatic "locomotive engines.

Two pistons are moved by the explosion of a mixture of air and gas introduced below them, and drive the atmospheric air between the pistons and the covers of the cylinders into a vessel for compressed air, which contains the cylinders. The partial vacuum after the explosion produces a descending stroke, and air is introduced above the pistons from a vacuum chamber. The working cylinders of the engine are connected with the compressed air and vacuum chambers, and the air, after driving the working pistons, passes into the vacuum chamber. The gas is supplied from stationary gas holders, about 20 miles apart by a hydraulic main, of a size sufficient to supply gas for only one train, whereby collisions are obviated. Gas and air pass by pipes regulated by cocks into a vessel partly filled with water through which the air and gas rise, and are mixed by passing through a perforated zinc plate. Or they may be supplied to the mixing vessel by pumps. In the exploding cylinders they are ignited by means of a tappet connected with a galvanic battery, and which moves so as to complete the current at proper intervals, and heat a piece of platina wire.

The explosive power of the mixture of air and gas is also used for propelling vessels, for which purpose four cylinders are placed near the keel, and are supplied with charges of explosive gas. The gas is exploded and pressing on the water within the cylinder which acts as a fulcrum propels the vessel forward. After

the explosion the water rushes back into the cylinder and expels the residue of the gases.

[Printed, 2s. 4d. See Drawings. Engineers' and Architects' Journal, vol. 8, p. 225.]

A.D. 1844, December 12.—N° 10,427.

FRANCHOT, CHARLES LOUIS FELIX.—This consists of a hot-air engine made of three cylinders placed one above the other, and connected by rings of thin or plate iron to prevent the temperature of one from being affected by that of the next. The upper cylinder contains the working piston, the centre one the hot, and the lower the cold air chamber. A displacing vessel works in the centre and upper part of the lower cylinder. This vessel consists of two parts, the upper heated by the flues in the hot chamber, and the lower cooled by a current of cold water; the two parts are connected by insulating joints, and are filled with bad conductors of heat. The vessel forces the air at the upper part of the lower cylinder down through tubes surrounded by cold water, and thence into a central tube, passing up through the cold chamber and the displacing cylinder into the hot chamber immediately below the working piston. The central tube is fitted with several separate rolls of metallic sheets which heat the air on the upward passage, and take back that heat from the air as it passes down. The hot chamber is heated by the flues of a furnace in the form of arcs of circles, which take up all the interval between the working piston and the displacing vessel, except some passages running from top to bottom. The displacing vessel is made to rise during a quarter of a revolution of the crank, it "remains stationary during the second quarter, descends during "the third, and again remains stationary for the fourth." The movements are effected by levers and cranks without the use of cams. For boats of light tonnage two pairs of generators should be employed, and these are modified from the construction explained above by having the height much diminished. The central tube is bent back on itself, and the air is cooled by cold water injected through rose heads, instead of being forced through tubes. Each generator has a cistern of cold water at the bottom, which communicates by pipes fitted with rose heads, with the cold chamber of the opposite generator. And as the generators act alternately, the difference of pressure in the two will drive the water through these heads.

[Printed, 3s. 4d. Drawings.]

A.D. 1844, December 27.—N° 10,447.

PINKUS, HENRY.—This Specification relates to various improvements in and systems of pneumatic or atmospheric railways. The engines used in connection with such railways are locomotive engines, for the most part of the ordinary construction, with piston cylinders, connecting rods, crank axles, and the usual ports and gearings, but having in connection with the cylinders a reservoir box furnished with a hollow propelling tongue. The tongue is inserted under the lip of the valve, and forms a clear way of communication between the interior of the main pipe, the reservoir, and the ports and slides of the engine. The engine is worked either by compression or exhaustion of the air within the main. Rotatory engines may be substituted for the engines already described. Two engines are applied to the straight axles of the large wheels, the rotatory apparatus being any of the well-known kinds. One is of size suitable to move a train on a level, and the other is used for ascending inclines, and may be thrown in and out of gear by a common clutch and lever. Another variation in the atmospheric railway is to place fixed rotatory engines at equal distances of about a quartèr a mile apart, and to connect propelling wheels by means of metal or other ropes or bands with these engines. These wheels act on bars placed under the axles of the carriages. Transfer pipes lead from one rotatory apparatus to another, and are furnished with throttle valves, and opened on the approach of a train by levers acting on piston cylinders. The train may also be propelled by endless ropes moved by the rotatory engines. The engines are also used to move pulleys, which propel boats on a canal by endless ropes. Another variation is to compress air into a reservoir connected with the propelling main by a piston, worked by the gravity of a train descending an incline, and thus generate power.

[Printed, 16*s*. 2*d*. Drawings. See Engineers' and Architects' Journal, vol. 8, p. 265.]

A.D. 1845, March 3.—N° 10,539.

TALBOT, WILLIAM HENRY FOX.—Motive power is obtained—

First, from carbonic acid frozen and placed in a vessel, through which several wires pass, which are heated at regular intervals by galvanic currents. This melts a part of the snow, and causes *it to assume* a gaseous state, in which it acts on the piston of a

cylinder. The voltaic circuit is formed and broken as described in the Specification of a former Patent, No. 8650, p. 92.

Secondly, from liquid carbonic acid contained in two vessels, the lower of which is rather warm. A jet of warm gas from this is made to enter the cylinder, and after having acted on the piston is partially condensed by being placed in communication with the cold upper vessel.

Thirdly, from expansible liquids.

Fourthly, from electro-magnetic engines.

Fifthly, from a wind machine consisting of two horizontal fly wheels, each bearing an upright piece of metal attached to one of its spokes. The two upright pieces are connected by a horizontal bar which carries a frame divided into compartments constructed like a Venetian blind. The frame remains parallel to itself during the revolution of the wheels, and is forced back by the wind with its shutters closed, and advances against it with them turned edgewise. A second frame at right angles to the first may be used to utilise winds at right angles to those which act on the first frame.

Lastly, improvements in atmospheric railways are described.

[Printed, 8*d*. Drawing. See Repertory of Arts, vol. 7 (*enlarged series*), p. 20; Engineers' and Architects' Journal, vol. 8, p. 331.]

A.D. 1845, March 3.—N° 10,544.

GORDON, ALEXANDER.—" Producing motive power by the " action or agency of heat."

The apparatus as applied to raising water consists of a fire-grate enclosed in a strong oval-shaped case with a valve at the top and bottom, and which is supplied with air by a blower. The heated products of combustion escape through the top valve, and pass by a tube with a second valve into a chamber nearly filled with water, which is forced by the pressure of these products up a pipe to a higher level. The chamber has two other tubes furnished with valves, one for the escape of the products of combustion, and the other for the admission of water from the lower level. The blower and the three valves of the chamber are worked by a water wheel turned by a portion of the water raised. The same principle may be applied to the propulsion of ships or vessels, and to locomotive purposes on land. In the former case the products of combustion are discharged into the water, and in the second

case into a close tube or pipe between rails similar to those employed in atmospheric railway communication, or these products may be discharged in a trough of water laid continuously between the rails, or even simply against the surface of a road, or even of turf, gravel, sand, or snow.

[Printed, 10*d*. Drawing. See Engineers' and Architects' Journal, vol. 8, p. 331; Mechanics' Magazine, vol. 43, p. 273, vol. 46, p. 205, and vol. 51, p. 174.]

A.D. 1845, May 24.—N° 10,688.

FELL, RICHARD.—The second part relates to a method of obtaining a partial vacuum, whereby motive power is obtained.

A hot water cistern is placed between two cold water cisterns. Two series of tubes communicating with hollow shafts are worked on centres, and are immersed alternately into the hot and cold water cisterns by means of a sway beam geared into pinions attached to the hollow shafts. These shafts are connected by suitable pipes and valves to the engine cylinder.

Another mode of effecting the same object is by having a tube coiled in the form of an Archimedes screw, which is attached to a hollow shaft working through stuffing boxes. The shaft is made to revolve forwards and backwards alternately, screwing the tube from the hot into the cold cisterns, and vice versâ.

[Printed, 1*s*. Drawings.]

A.D. 1845, June 3.—N° 10,702.

HOOD, JOHN LIONEL.—In this Specification there are three branches. First, compressing water or other fluid on the principle of "Bramah's press." Secondly, using spiral springs similar to those employed in watch work for giving action to machinery. The springs may be used for giving a vibratory motion to levers of force pumps, or any convenient number of springs with their drums may be carried on a railway and used as a magazine of power. The relaxed springs may be wound up at the terminus by a crane, stationary engine, or other power. Thirdly, gaining power by means of heated air and a mixture of expansive gas with or without the admixture of steam. This is done by an engine in which the heated air and expansive gases from the chimney of the furnace are made to pass through a refrigerator consisting of a number of chambers communicating alternately with each other, and having free air spaces between them. From it the air and gases

go into a double acting air pump, by which they are condensed and driven into the calorifere, which is a convolution of metal pipes placed above the furnace. From these pipes the air and gases pass to the motive cylinder, which is placed in the funnel or chimney above the furnace. The air pump may be made to draw the air or gas from the working cylinder instead of from the chimney. Steam when used should have a separate coil of hot pipes, and must communicate direct with the cylinder instead of passing through the air pump. Carbonic acid or hydrogen gas may also be generated in other parts of the engine, and used in the place of the products of combustion.

[Printed, 1s. 2d. Drawings.]

A.D. 1845, June 26.—N° 10,738.

BAGGS, ISHAM.—Cold air is pumped into a generator, where it is heated, and thence passes into the working cylinder, which is placed within the generator. The hot air is cut off at about one-fourth of its stroke. After it has expanded there it is injected into the fire, so as to increase the intensity of combustion, and economise fuel.

The engine described has two cylinders, moving cranks placed on the same shaft at an angle of about one hundred and forty degrees.

[Printed, 1s. 6d. Drawings. See Engineers' and Architects' Journal, vol. 9, p. 92.]

A.D. 1845, July 12.—N° 10,767.

SHEAF, HORATIO SYDNEY.—" Certain improvements in obtain-" ing and applying motive power."

[No Specification enrolled.]

A.D. 1845, July 12.—N° 10,771. (* *)

SHAW, JOHN.—" A hydro-pneumatic engine," which consists of a cylinder with two revolving ends. In order to work it, fill this cylinder with water; then shut the tap or valve, and with the pump bring part of the water out, which will leave a vacuum, except the water which is not elastic. When the external pressure of air will press the tubes internally, consequently putting [pulling ?] the arms of the axletree, they must turn, which also carries the ends as they are fast; thus, the continuous pull upon the

arms; the axletree goes round with them, when one air pump will keep up the vacuum if any air rushes in with friction, and the crank will turn any other machine required.

[Printed, 6*d*. Drawing. See London Journal (*Newton's*), vol. 28 (*conjoined series*), p. 32.]

A.D. 1845, August 28.—Nº 10,822.

ISOARD, Mathieu Francois.—"Motive power" is obtained by making water or other fluid flow into a circular tube in an apparatus composed of two or more tubes arranged spirally placed within the fire-place. The water or fluid is converted into steam or vapor, which escapes at the opposite end of the tubes to that at which the fluid is introduced. By this means the tubes and apparatus and fire-place are drawn round rapidly, and the rotary motion is communicated to a hollow shaft, which by wheels makes a second shaft to rotate. The water or fluid is pumped up the hollow shaft by a pump worked by an excentric on the second shaft. The air for the fire is drawn in through openings near the centre of the lower part, by which a chimney to obtain a draft is made unnecessary.

[Printed, 10*d*. Drawing. See Repertory of Arts, vol. 7 (*enlarged series*), p. 230. Engineers' and Architects' Journal, vol. 9, p. 121.]

A.D. 1845, September 18.—Nº 10,830.

LAUBEREAU, Joseph Francois.—Motive power is obtained from the expansion of heated air. The piston of the cylinder when almost at the bottom of the stroke presses upon a lever, by which a communication is made between the cylinder below the piston and a reservoir of heated air. The reservoir contains a lamp enclosed in a box, and with fire covers, which are open. The air expanding forces up the piston, which at the end of its stroke presses against another lever, and by it the communications below the piston is closed, the fire covers shut, and a fresh volume of air allowed to pass from a ventilator to the reservoir. The covers are afterwards opened to heat the air by means of a wheel acting on a beam. A twenty horse-power machine on the same principle is also described. In it two reservoirs communicating with the cylinders respectively above and below the piston, and (by openings closed with valves or fire screens) with a fire-place, having a furnace whose chimney does not communicate with the receivers. The fire screens are opened alternately, and the valves

in the passages leading to the cylinder from the receiver is at the same time opened by means of rods or levers in connexion with the piston rod.

[Printed, 1s. 2d. Drawings.]

A.D. 1845, October 2—N° 10,848.

SIMPSON, John.—"Certain improvements in obtaining and "applying motive power."

[No Specification enrolled.]

A.D. 1845, October 16.—N° 10,867.

WILKINSON, David.—Combining heated air with steam to act together in moving the piston of an engine. An air pump, which may be of about half the cubic contents of the cylinder, drives atmospheric air through tubes or other suitable apparatus externally heated into the steam boiler or generator, so that the heated air combines with the steam to work the engine. The invention is best suited for high-pressure engines. No claim is made to the use of heated air combined with steam when the air has been passed in contact with the fire and then with the products of combustion into the steam boilers.

[Printed, 4d. No Drawing. See Repertory of Arts, vol. 8 (*enlarged series*), p. 38. London Journal (*Newton's*), vol. 28 (*conjoined series*), p. 266; Mechanics' Magazine, vol. 44, p. 462. Engineers' and Architects' Journal, vol. 9, p. 152.]

A.D. 1845, November 3.—N° 10,910.

BIDDLE, Richard.—Driving mills by the power of the wind. The engine has a vertical shaft, two or more radial arms with sail booms which extend the length of the arms, and are supported at each end by eye bolts, in which they can turn freely. Two sails are fixed at right angles to each other on the boom, one on either side the shaft; weights are fixed as a counterpoise beneath each sail on the underside to the half of the boom to which it is attached. The sails rest at an angle of about forty-five degrees. From the end of the arm stays are carried to a triangle on the head piece and to the shaft. The action of wind raises one sail to a vertical position, and causes it to bear against the stays behind, while the opposite sail is depressed to a horizontal position. The sails may be attached to the upper sides of the radial arms, or may be underhung, or two sets may

be employed "working in different planes, the one above the " other, in which case the sails of the two sets should be so " alternated that the overhung sail of the set shall always be " succeeded by an underhung sail of the other set."

[Printed, 8*d*. Drawing. See Mechanics' Magazine, vol. 44, p. 433; Artizan vol. 6, p. 92.]

A.D. 1845, November 4.—N° 10,920.

ATHA, JOSEPH RICHARD.—"This invention consists of four " or more sails fixed upon a stationed supporter, which sails are " made to revolve by the pressure of the wind. To the fulcrum " or shaft of the sails are attached two force pumps." The air is forced by these into a main receiver, from which a minor receiver is charged. The condensed air in the latter is made to act in cylinders in a similar way as steam.

[Printed, 4*d*. No Drawings. See London Journal (*Newton's*), vol. 28 (*conjoined series*), p. 336. Patent Journal, vol. 1, p. 23. Engineers' and Architects' Journal, vol. 9, p. 185.]

A.D. 1846, January 22.—N° 11,058.

CAMPIN, FREDERICK WILLIAM.—(*A communication.*)—This is for a propelling apparatus which consists, first, of springs, to the ends of which are attached conical screws which press upon the wheels; by the reaction of which springs combined with the weight of the vehicle to be propelled, the centre of gravity is changed and motion produced; and, secondly, of a set of pneumatic helicondal fly wheels or air turbines, by the aid of which the motion so acquired and the adhesion of the wheels are kept up. The springs are loosened by setting free a detent. The invention may be applied to marine propulsion when throttles are made in the bow to force the air to be condensed upon the paddles, which air afterwards enters the turbines.

[Printed, 6*d*. Drawing. See Repertory of Arts, vol. 8 (*enlarged series*), p. 285; London Journal (*Newton's*), vol. 29 (*conjoined series*), p. 163.]

A.D. 1846, February 3.—N° 11,072.

BROWN, SAMUEL.—"Improvements in gas engines, and in " propelling carriages and vessels."

[No Specification enrolled.]

A.D. 1846, February 11.—N° 11,077.

CLARKE, THOMAS, FREEMAN, MARK, and VARLEY, JOHN. "Motive power." The 8th head of the invention is for applying the power of atmospheric pressure or steam to pile-driving engines. These are made with a cylinder having a longitudinal slit like the traction tube of an atmospheric railway, but which slit is covered with some substance capable of withstanding heat. The cylinder has a semi-globular piston linked to a connecting plate sliding with guide wheels on the tube, and to which plate the monkey is attached. The air is exhausted above the piston in order to raise the monkey. The guide wheels may be dispensed with in other forms of the engine.

The 9th head is for applying the same power to excavating, tunnelling, boring, drilling, and the like. The cylinder is made without slit and is open at the top. The air below the piston is exhausted and the piston sinks, drawing up the cutting tool which is disengaged in the same manner as the monkey in the pile engine. A monkey is sometimes used to cleave the ground. The piston may also be connected by a plate with the cutter, in which case a longitudinal slit will be required. In another instrument a bucket with a sharp scooping out edge is raised by exhausting the air above the piston. Other similar engines are described.

The 10th head is for applying such power to engines for sawing stone. The saws are directly connected with the piston rod of a small air cylinder and slide with it in a groove in the frame.

11thly, the invention consists in substituting for the revolving axle used to work the stampers of stamping mills a number of air cylinders.

12thly, in applying a cylinder similar to that of pile engines to the loading and unloading ships; and the

20th head in applying atmospheric power to working machinery for tilling the ground. An exhausting power steam engine or wind or water mill is erected on one spot, and from it a main traction tube with a number of smaller pipes fitted with valves is conducted. The plough or scarifier is connected by ropes to two drums, so that as the plough advances in a particular direction one is wound and the other unwound on its drum. Motion is

given the chains by a pair of vibrating cylinders. Similar machinery may be applied to rope works.

[Printed, 7s. 6d. Drawings. See Mechanics' Magazine, vol. 45, pp. 217 and 252. Artizan, vol 6, p. 214. Engineers' and Architects' Journal, vol. 10, p. 91.]

A.D. 1846, February 16.—Nº 11,091.

NASMYTH, JAMES.—Engines worked by steam, air, or other elastic fluids are made with two cylinders whose lower ends are connected by a tube. The space below the pistons is filled with air or other fluid not capable of condensation. The ends above the piston are alternately in vacuo and filled with the motive agent. The power thus obtained will be twofold with one jet or one cylinder of steam. Additional cylinders filled with air, gas, or other fluid not capable of condensation may be connected by tubes with these two cylinders, and the amount of power will thus be multiplied in proportion to the number of cylinders, less the loss occasioned by friction. A new method of obtaining a vacuum alternately in two cylinders "by the power which they "carry" is also described. The piston rods of the two cylinders are connected by a beam. Each cylinder has two tubes leading from the spaces above and below the piston to vacuum cisterns, which are exhausted by pumps worked by hand in order to start the engine, but afterwards by the beam of the engine. There are valves to admit or shut off the pressure of the atmosphere in the two cylinders, and also to shut off the communications between the cylinders and the vacuum cisterns.

[Printed, 8d. Drawing. See Patent Journal, vol. 1, p. 230; Engineers' and Architects' Journal, vol. 9, p. 320.]

A.D. 1846, June 17.—Nº 11,245.

CORMACK, WILLIAM.—Motive power is obtained, first, by traction and rarefaction without the agency of the external pressure of the atmosphere. Two boilers, one containing air, and the other exhausted, are connected to the working motion, and the external pressure cut off. Two similar boilers are then also attached to the working motion, and a commanding power is obtained by alternately opening and closing each rarefaction and vacuum slide. Weights of metal or fluid may be attached to the vacuum boiler and drawn up by traction, so as to obtain power by alternate traction and gravitation.

Secondly, by the decomposition of water into oxygen and hydrogen by platina wires heated to redness. Also from the sesquicarbonate of ammonia dissolved in one-third its weight, or the bicarbonate dissolved in water in an equal weight, and then placed in the boiler of a steam engine, by which great pressure is obtained with a less amount of heat. The carbonates after condensation are brought back to the boiler. Also from caustic ammonia, to a gallon of which of the specific gravity of eight hundred and eighty, two pounds of unslacked lime are applied. The mixture is placed in a boiler to which heat is applied, and hydro-nitrogen gases then pass over for some time into a second boiler or generator. The gases are afterwards made to force up the piston, and becoming condensed in the condensing chamber form a partial vacuum, which draws down the piston. The condensing chamber contains water, which is replaced in the small boiler, but no lime is added. The gases are then again driven off by heat, but into a separate generator, so that the two are applied alternately.

[Printed, 4d. No Drawings. See Repertory of Arts, vol. 11 (*enlarged series*), p. 182.]

A.D. 1846, June 29.—N° 11,273.

ANDERSON, Sir James Caleb.—Obtaining motive power. The first method is by a power wheel having eight cylinders attached to the rim, each opposite pair being connected by pipes, and fitted with pistons connected together by rods. Four cylinders on the same side are filled with water, the weight of which causes the wheel to begin to revolve. As each cylinder arrives at a position a little before its lowest, the pistons in it and the opposite are made to ascend, and the water is transferred to the upper cylinder. The motion of the pistons is caused by anti-friction rollers coming in contact with cams, or by exhausting the air in the upper cylinder by an air pump worked by a water wheel or otherwise.

The second method applies to locomotion. A railway is made with a succession of undulations, and as the locomotive carriage descends by gravity, air pumps are at work, and fill a vessel with compressed air, which is used in conjunction with power wheels to propel the carriage up the ascent. The seventh part of the invention consists in using gun cotton or yarn to work a piston and cylinder. There are two cylinders en-

larged at their outer extremity, and having pistons connected together by side rods, and each furnished with a valve to allow the escape of the gas during the return stroke. The cotton or yarn is fed by rollers alternately in the inner extremity of each cylinder through a narrow slit, and is exploded by wires of a galvanic battery.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1846, July 6.—N° 11,278.

THOMPSON, James.—Obtaining motive power. A pulley is made to revolve by a band from a pulley on the fly-wheel shaft. At each end of the shaft of the pulley is a slot lever, which moves round with it. A friction roller works on the slot, and is attached to the end of an arm of a crank, of which the lever forms one arm, and of which the parallel arm is about half the length of the lever. At the angle of the short and the transverse arm is a heavy weight, which at one period of the revolution of the shaft is at the extremity of the slot lever furthest from the shaft, and after the shaft has revolved through two right angles at the opposite extremity. The motive power is obtained from the difference of the power required to raise the weight, and the pressure exerted by it at the end of the slot furthest from the shaft. A float acting in a cylinder filled with water may be substituted for the weight, or steam gas or air may be substituted for the water, and a piston for the float. The shaft with the two slot levers, or a single such lever applied to the wheel or driver, are added to a steam engine or other apparatus for obtaining motive power.

[Printed, 1*s*. 2*d*. Drawings.]

A.D. 1846, November 5.—N° 11,442.

MABERLY, Frederick Herbert, BRANWHITE, Thomas, and LUSHER, Dennis.—Part of this is for a carriage driven by springs, several of which are arranged in a box so that the eyes of the springs nearest the middle are less than those nearest the outside, so that each may easily be wound up separately by hand or steam and mechanical powers combined. There are a succession of toothed wheels and a chain in order to drive the wheels. These may also be worked by a compound lever working a cranked axis, in which case a triangle with a fulcrum at one angle and the

other sides attached to levers may be introduced to increase the power of the machine. Another part is for a windmill the sails of which are kept in or brought in or out of the wind by means of a jointed tail. A rope with a weight attached is fastened to the tail and passes over a pole in a line with the framework of the mill and keeps the tail in its place, allowing it to bring the sails out of the wind when the gale is too strong. A similar weighted rope passing over a pole at right angles to the first draws the tail when hung on it in a line with the mill sails and so brings the sails edgeways to and so out of the wind.

[Printed, 1s. 4d. No Drawings. Patent Journal, vol. 3, p. 34.]

A.D. 1846, December 7.—N° 11,475.

TALBOT, William Henry Fox.—Motive power is obtained by exploding solid substances by means of a galvanic current cut off and restored in the manner described in Letters Patent of No. 8650, p. 92. Gunpowder cannot be safely used for the purpose but less explosive powders and especially gun cotton may be employed. The cylinder has two circular apertures in its sides near the bottom. Through these a rod is thrust in which are a number of small cavities placed at equal distances and charged with the gun cotton or other material. The rod is drawn forward during the descent of the piston through a space equal to the distance between the cavities. A sufficient length of these rods should be prepared and kept in store ready charged.

[Printed, 6d. Drawing. See Repertory of Arts, vol. 10 (*enlarged series*), p. 124. London Journal (*Newton's*), vol. 30 (*conjoined series*), p. 397. Patent Journal, vol. 3, p. 54.]

A.D. 1847, January 16.—N° 11,532.

LESNARD, Frederick.—Rotative machine to be worked by compressed air or gas or steam. This consists of a wheel having eight tubes which form the spokes. Upon the outer ring are screwed eight small tubes, four of which turn the wheel in one direction and four in another. The axes of the wheel have stuffing boxes at their ends in connexion with tubes passing to a reservoir for compressed air. The wheel is enclosed in a case which communicates with the cylinder of an air pump. The piston of this has a rod of two parts sliding one into the other, and is itself formed of two plates the upper fixed to the outer and

the under to the inner rod. The packing is formed of three portions of segments of circles, two placed one upon the other, pressing against the cylinder, and the third placed on the inner part of the others. By turning a nut the plates of the piston are brought together and the packing caused to press against the sides of the cylinder. The valves are opened and shut by an excentric formed of two portions of a circle of the same radius and placed together. They are fixed by bolts which allow the parts to be brought nearer to or further from one another. At the upper part of the bolts are two flat rods which slide in grooves.

[Printed, 1s. 6d. Drawings. See Patent Journal, vol. 3, p. 216.]

A.D. 1847, February 1.—N° 11,559.

FRANZONI, Marco Henry.—"Improvements in obtaining " and applying motive power."

[No Specification enrolled.]

A.D. 1847, February 8.—N° 11,570.

GEARY, Stephen.—In the place of the middle wheels of the six wheel locomotive engines, wheels are made with cylinders and pistons arranged around them in such manner that the outer extremity of the piston rods pass in a radial direction and protrude beyond the peripheries of the wheels. "Assuming motion to be " imparted to the said wheels and that their peripheries are in " constant contact with the rails upon which they move, it will " appear evident that as the piston rods which are situate therein " are successively brought into contact with the rails by the " rotation of the said wheels they will produce reciprocating " movement of the said piston rods and pistons attached thereto " and have the effect of forcing a certain amount of atmospheric " air with which the cylinders are previously charged into a " reservoir suitably placed as hereafter described, and the power " so accumulated may be effectively applied and rendered available " in the manner" there described. The cylinders may also be employed for exhausting air from the revolving cylinder. Three examples of thus obtaining motive power are given. In the first two the cylinders are arranged as the spokes of a wheel and the pistons are restored to their original positions by springs. In the third the cylinders are arranged in a circle and the pistons forced down by wheels rolling on an endless rail.

[*Printed*, 1s. 10d. Drawings. Patent Journal, vol. 3, p. 291.]

A.D. 1847, March 10.—N° 11,615.

NEWTON, William.—(*A communication.*)—"Ether-hydric "engine." The invention consists in employing the waste heat of the eduction steam to vaporize ether or other volatile fluid, and in working the pistons of additional cylinders, and in condensing the steam by such vaporization. The vaporizer or generator is composed of a number of copper tubes, enclosed in a jacket of iron, and fastened to end plates by metal applied when molten. The luting used is paper steeped in gum arabic. The packing is effected by a band of leather wrapped round two conical tubes, separated by a space about equal to their length. This is placed in a box into which water is introduced, and given by a pump a definite pressure, according to the pressure indicated by the manometre of the ether vapor. The cocks are covered with lead, and are made air tight by an iron valve working in a screw. The condenser is surrounded by a case supplied with fresh water in stationary or marine engines. In locomotives it consists of pipes exposed to the air, and covered with cloths kept wet. In the place of the copper tubes the generator may be constructed of a number of concentric tubes of copper, formed by doubled sheets of copper, having originally zinc between the folds, but which zinc is melted out as described.

[Printed, 3*s.* 8*d.* Drawings. Patent Journal, vol. 3, p. 427.]

A.D. 1847, March 16.—N° 11,625.

NEWTON, William.—(*A communication.*)—"Ether-hydric "engine." This consists of improvements of an invention for which Letters Patent have previously been obtained, No. 11,615, It is an engine with two distinct boilers and two separate cylinders, the first of which is acted upon by steam generated in one boiler, and the other by the vapour of sulphuric ether, or any other moderately cheap and easily vaporised liquid generated in the other boiler. "The principal parts of the engine are con- "structed much in the same way as those of the ordinary double "action and marine and locomotive steam engines." The second boiler or vaporizer, consists of a large number of copper tubes to the outside of which the steam which escapes from the steam cylinder is conducted. It there parts with its caloric to vaporize the ether, and thereby becomes condensed. The ether, after acting in the cylinder is condensed in a metal condenser, kept

cool by means of cold water or a current of air, and is then pumped back into the ether boiler. The water in the cylinder surrounding the ether boiler, resulting from the condensation of the steam, is also carried back in a warm state to the steam boiler. The manner of forming the vapor boiler and condenser, and of making luting of paper steeped in a thick solution of gum arabic, and of an improved construction of packing for the piston and other moving rods and of cock, without employing fatty matters, which would be decomposed by the ether are described.

[Printed, 3s. 8d. Drawings.]

A.D. 1847, March 23.—N° 11,637.

TIBBITS, WILLIAM BULLOCK.—The second part of the invention is for working atmospheric railways by a fan wheel which turns an horizontal axis, to which two propelling wheels are attached. These are bevilled, and move the carriage forward by being made to act on sliding friction rods, with wedge-shaped edges. The fan wheel is set in motion by closing a valve which turns on its centre a quarter of a circle, and opens a passage beneath; a second valve commands passages over and under the wheel. By shutting the first valve and opening the second a current is produced to either passage. The axis of the fan wheel may be made to work traction band ropes or chains, and in like manner any other sort of machinery can be actuated.

[Printed, 2s. 2d. Drawings. See Mechanics' Magazine, vol. 47, p. 371.]

A.D. 1847, April 20.—N° 11,669. (* *)

WALKER, JOHN.—"Improvements in certain hydraulic and " pneumatic machines, and in the application of steam or other " power thereto."

One of these improvements relate to "the application of re- " volving vanes in sets inclined in opposite directions upon a " spindle, as a means of obtaining power when acted upon by a " column of water or current of air under pressure."

[Printed, 1s. 2d. Drawings. See Mechanics' Magazine, vol. 49, pp. 53 and 145, and vol. 50, p. 206; Patent Journal, vol. 3, p. 525; Engineers' and Architects' Journal, vol. 10, p. 389.]

A.D. 1847, May 22.—N° 11,713.

AITKEN, JOHN.—The second invention described consists in working an engine by atmospheric pressure. A tube under thirty

feet is placed vertically in a tank of water, and the top is bent down, and communicates with a smaller descending pipe leading to a valve box or side pipes with induction and eduction valves, such as are used in steam engines, these are connected with a piston and cylinder. Four rotary tubes which revolve from the pressure of the piston are placed on the eduction pipe. The air is pumped out of the ascending tube by an air pump worked by the engine, and having a pipe leading to the top of the tube. When the tubes are full of water the piston is moved by some external power, the water in the cylinder will then pass out through the revolving tubes, and that in the descending tube will descend to act on the piston. The motion will be continued by the momentum of the falling water, and the lessened resistance of the atmosphere to its discharge, produced by the centrifugal force of the revolving tubes.

[Printed, 4d. No Drawings. See London Journal (*Newton's*), vol. 31 (*conjoined series*), p. 411: Patent Journal, vol. 4, p. 4; Practical Mechanics' Journal, vol. 3, p. 70; Artizan, vol. 7, pp. 170, 195, and 242.]

A.D. 1847, June 28.—N° 11,770.

HORNBLOWER, Henry.—"Certain improvements in obtaining motive power."

[No Specification enrolled.]

A.D. 1847, July 17.—N° 11,800. (* *)

VON RATHEN, Anthony Bernhard.—"Certain universal " wheels, or improved direct rotatory engines to be worked by " steam, air, or any other elastic powers."

"The great and general feature of distinction between this " and the common emitting and re-acting rotary machines is that, " in the latter, when the steam is emitted from the aperture in the " arm of the wheel, the expansive force it still contains is lost. " In the 'universal wheel' the steam issuing from the supply " pipe enters through one or more orifices into a chamber " enclosed on all sides but that opposite the orifice; and the " space of this chamber is enlarged from the orifice to the open " end; and the steam in its passage through it gradually expands " and developes its elastic force, which united to the original " pressure of the steam forms the total amount of propelling " power."

This engine resembles Hero's whirling oelipile, only instead of the steam issuing unexpanded into the air from a small orifice at the end of the revolving arm, it issues from a small orifice that opens into the smaller end of a tube having the form of a hollow cone, the greater end open to the steam-tight case in which it revolves, and it operates by the reaction of the steam issuing from the small orifice on the diverging trumpet-like surface of the hollow cone.

This form of the machine has been developed with great care; numerous combinations and modifications of the details are exhibited in a number of careful drawings made to a large scale.

[Printed, 2s. 10d. Drawings. See The Pneumatics of Hero of Alexandria, edited by B. Woodcroft, p. 72, 1852. Patent Journal, vol. 4, p. 269; Artizan, vol. 6, p. 57.]

A.D. 1847, July 20.—N° 11,807.

GIRARD, Louis Dominique.—Part of this invention relates to a method of forming and packing the pistons of pumps, air engines, and other machines. The packing consists of a strip of leather or other suitable material fixed to the sides of the piston, and to the vessel in which it works, and which forms a fold having a free space in the circular space between the piston and the vessel. When the piston descends the strip will be brought down to the inner side of the vessel. The piston described in connection with a hydraulic apparatus has a cylinder attached to its centre. The extreme sides of the piston are connected with this cylinder by means of an annular valve seat intended to eceive a circular valve suspended from one holder and sliding on another, which valve surrounds the cylinder and is kept up by a spiril spring. The cylinder of the piston in the apparatus described works over a fixed cylinder provided with a similar valve which is placed in the vessel.

[Printed, 10d. Drawing. See Repertory of Arts, vol. 11 (*enlarged series*), p. 143.]

A.D. 1847, October 7.—N° 11,897.

FELL, Richard, and FELL, James.—Motive power is obtained from arrangements "whereby the elastic force of steam or the "pressure of the atmosphere on a vacuum produced by the con-"densation of steam, or the pressure of water is employed in "combination with the force obtainable from the compression

"or rarefaction of air to propel carriages on railways." To carry this into effect air is compressed by a cylinder worked by a stationary steam engine and is conveyed by a main or pipe placed centrally between the rails to reservoirs at equal distances along the line. A set of pipes pass from the reservoirs up through but do not communicate with the central pipe, and terminate flush with the outside of it. The engine (nearly similar in every respect to a locomotive engine) is furnished with a long slido valve or slipper bar which embraces the central pipe for about three-fourths of its circumference. Into a chamber of this valve a pipe leads from the ante-chamber of the engine, and the lower side of the chamber is perforated with a series of holes furnished with valves to prevent the escape of air. The pipes from the reservoirs are also furnished with valves having levers weighted so as to keep them down. These levers are lifted up by a bar attached to the engine, so as to allow the compressed air to enter into the chamber of the slipper bar, If rarefied air be used instead of compressed air the only material difference is in the disposition of the valves.

The conveyance of the compressed air to the reservoir may be regulated by cylinders and pistons communicating with an additional pipe from the compressing cylinder, and which act as valves allowing air to pass into the reservoirs when the pressure in them is less than in the additional pipe.

[Printed, 1*s*. Drawing. See Mechanics' Magazine, vol. 48, p. 481. Practical Mechanics' Journal, vol. 2, p. 191. Artizan, vol. 6, p. 191. Patent Journal, vol. 4, p. 503.]

A.D. 1847, November 2.—N° 11,932.

VON RATHEN, Anthony Bernhard.—The first part relates to apparatus for compressing and condensing air. In this part a refrigerator is described, of which the novelty consists in having two cylindrical tubes, fitted one over the other, the cooling medium being allowed to flow through the open space of the internal and to surround the external tube. The second part of the invention relates to improvements in the system of propelling carriages by compressed air described in the inventor's former Patent, No. 9038, Old Law. High pressure air from the reservoir is made to enter a set of expanding and warming tubes and thence a moderator or chamber provided with a piston which is forced into the chamber by the action of a regulating spring or weight, and raised by the pressure of the air. Several modifications of such chambers are

described. The warming and expanding tubes are on the same principle as the cooling apparatus already described. By means of them the air of about fifty atmospheres which enters the propelling apparatus is gradually reduced to about five atmospheres, while keeping its heat and consequent elasticity. The air may be made to enter two expanding cylinders, one longer than the other, before entering the warming tubes or the rotating wheel described in the Patent No. 9038 may be used. From the moderator the air passes into the working machinery.

[Printed, 1*s.* 10*d.* Drawings. See Artizan, vol. 5, p. 152.]

A.D. 1847, November 11.—N° 11,956.

KINSMAN, ISRAEL.—(*A communication from Henry Graham Thompson.*)—Rotary engines to be worked by steam, air, or other elastic fluid. They consist of a stationary cylinder within which works a rotating piston wheel. The pistons are formed by projections from the periphery of the wheel, the outer lines of such projections being opposite tangents. A longitudinal radial groove is cut out of each piston into which is fitted a metallic packing in three parts, the outer having the edge to fit the periphery of the cylinder against which it is kept continually pressed by a spring or other elastic packing. The stops must be less in number than the pistons. They are moved in and out by cams. There is one port on each side of each stop, and as many at each end of the cylinder as there are stops. On each side of the cylinder is an annular pipe, one communicating with the ports on one side of the stops, the other with those on the other. They both communicate with the steam pipe and the exhaust pipes by means of branch pipes furnished with throttle valves so that only one annular pipe should be in communication with the steam pipe, but that the action of the engine may be reversed at once by means of the throttle valves.

[Printed, 1*s.* 8*d.* Drawings. See Artizan, vol. 6, p. 153. Patent Journal, vol. 5, p. 69. Engineers' and Architects' Journal, vol. 11, p. 216.]

A.D. 1847, December 18.—N° 11,999.

SQUIRES, WILLIAM WESTBROOKE.—" A mode or modes of " producing a vacuum, which mode or modes may be applied to " pneumatic, hydraulic, and hydrostatic apparatus, and to ma- " chinery for obtaining motive power."

[No Specification enrolled.]

A.D. 1847, December 22.—N° 12,006.

SIEMENS, Charles William.—" Regenerative engines. The " peculiarity of these engines consists in so arranging the parts " that the elastic fluid used in the working cylinders after it has " exerted its force is received into a series of chambers in succes- " sion as the density of the fluid decreases, each receiving cham- " ber being closed as soon as the next is opened; the first " chamber receiving the most dense fluid, and the last chamber " the least dense or most expanded fluid; and then such cham- " bers give out the fluid to the working cylinders in the reverse " order, that is, commencing with the chamber containing the " least dense fluid, and ending with the chamber containing the " most dense fluid." The regenerator suitable for using air or other incondensible fluid consists of a series of separate boxes placed one above the other in a cistern in such a manner that a current of cold water enters through a pipe near the bottom, and passing in a zig-zag direction through all the compartments absorbs heat therefrom till it comes to a pipe in the top compartment. The pressure of air is maintained by forcing air into the top compartment by a pump worked by the engine. In the steam engines described, the working cylinders are two, each having a plain concentric inner cylinder. into which a piston fitted with a trunk works loosely. This trunk is forced out by the elastic fluid. There is a free communication between the ends of the cylinders. The top communicates with the chambers of the regenerator by double beat valves, which begin to open in succession when the crank has nearly reached its top centre, and again when the crank is passing its bottom centre.

[Printed, 1s. 10d. Drawings. See Repertory of Arts, vol. 12 (*enlarged series*), p. 209; Practical Mechanics' Journal, vol. 3, p. 91; Artizan, vol. 6, p. 179, and vol. 8, p. 138; Patent Journal, vol. 5, p. 145; Engineers' and Architects' Journal, vol. 11, p. 249, vol. 13, p. 200.]

A.D. 1848, January 13.—N° 12,026.

WILSON, Robert.—Rotatory engines worked by steam or other elastic fluids. Part of the invention is also applicable to rotatory engines worked by wind. The first part consists of a rotatory engine composed of several hollow radiating arms enclosed in a case. The air is conducted along the hollow axis, and escapes into the case by the extremity of the arms. From the case it is

conducted to a second engine on the same axis similar to the first, but with either more or larger jets. By acting on a succession of these engines the steam is made to act expansively.

The second part consists of an engine with an annular wheel, or series of vanes curved like a semicircle. Steam enters the first spaces between the vanes, and impels the wheel by impact on the vanes. It afterwards gives a second impulse in the same direction by its reaction, as it leaves these spaces and enters the receiving chambers, which are spaces between fixed vanes on either side of and close to the moving vanes. In these chambers the steam expands, and re-enters the spaces between, and again strikes against the moving vanes.

The third part consists of an engine with two wheels moving in opposite directions, and each consisting of a series of annular arms of semi-circularly curved vanes. The moves of one wheel alternate with those of the other, and the vanes of one wheel have their convexities turned in the opposite direction from those of the other. The steam will thus act both by impact and reaction, and by making the rows with progressively longer spaces between the valves also expansively. The axles of the two wheels must be connected in such a way with a third axle as to unite in turning it in the same direction, or one wheel may be fixed.

The fourth part is the application of the wheels described in the third part to the action of wind or water. The wind is made to enter the spaces between the vanes, which may be angular or curved.

[Printed, 3s. Drawings. See Artizan, vol. 6, p. 227. Patent Journal, vol. 5, p. 221. Engineers' and Architects' Journal, vol. 11, p. 285.]

A.D. 1848.—January 25.—N° 12,042.

HORNBLOWER, HENRY,—Rotary engine to be worked by steam or other elastic vapour. The ends of the pistons are made to work in guides made in moveable discs or rotary end plates, the ordinary end plates merely serving as covers. There are four pistons fitting into recesses in a drum which are made to recede as the drum rotates, and brings them in contact with a cam piece or eccentric. When one is pushed back the opposite one will be forced outwards into contact with the cylinder. The pistons have ears to assist their motion when they come against the cam piece. Their edges are furnished with leather packing.

working in corresponding grooves in the rotary end plate. The cam piece has an adjustable stop.

[Printed, 8d. Drawing. See London Journal (*Newton's*), vol. 33 (*conjoined series*), p. 178. Artizan, vol. 6, pp. 202 and 248. Patent Journal, vol. 5, p. 252.]

A.D. 1848, February 9.—N° 12,061.

BUCHHOLZ, GUSTAV ADOLPH.—"Improvements in obtaining "motive power."

[No Specification enrolled.]

A.D. 1848, February 16.—N° 12,069.

WESTON, JOHN.—The first part of this invention relates to the generation of steam for motive power by means of hot air. Compressed air is forced into a vessel where it is warmed by means of tubes containing waste or other steam and passes into an upright pipe around which the fire-grate is built. This is supplied with air from openings in the upright pipe and has four retorts at the upper part filled with small coal from which the fire receives its supply. The gases from the retorts and the fire mixed with the air pass out by a tube into a valve box in which they are mixed with the compressed air from the upright tube and then enter a T-shaped tube in the boiler. The other end of the horizontal part of this tube passes into the chimney. The lower part has a valve to regulate the admission of the air and gas into the boiler. The heated air and gases are deprived of the excess of their caloric by passing into the water of the boiler through finely perforated zinc plates by which they are divided into small jets. In another part of the invention which relates to a new system of applying motive power for propelling carriages on railways the tube and train there described have motion imparted to them by a modification of the engine before described. In this the steam chamber in which the steam is generated is separated by a plate from the adjoining chamber of the boiler and is made to communicate with the flue from the fire-place by a flap valve or door mounted upon hinges.

[Printed, 4s. 6d. Drawings. See Artizan, vol. 6, p. 262. Patent Journal, vol. 5, pp. 346 and 411.]

A.D. 1848, March 8.—N° 12,085.

HOUSTON, JOHN.—Motive power from heated air. A constant supply of atmospheric air is compressed by the working of a

steam engine, and is caused to pass into a reservoir whence it is conducted directly or through a copper tube acted on by the fire of the furnace to the heating apparatus contained in the steam boiler, consisting of numbers of tubes connected in clusters so arranged that the air may be detained sometime and raised to the temperature of the steam. It is then made to act in a cylinder twice the size of the steam cylinder and is discharged either into the air, or better, into the ash pit, or at the bridge or over the fuel of the furnace, so as to be the means or partly the means of keeping up the combustion.

[Printed, 4d. No Drawings. See Repertory of Arts, vol. 13 (*enlarged series*), p. 105. Artizan, vol. 7, p. 14. Patent Journal, vol. 6, p. 3.]

A.D. 1848, June 10.—N° 12,182.

WANT, Richard and VERNUM, George.—The invention consists in making an oscillating engine, which may be worked by steam, air, or other fluid, in which the cylinders oscillate on a hollow transverse trunnion with which they communicate at bottom. This trunnion has two sets of passages. Steam may be admitted from the boiler by a six-way cock in the centre of the trunnion into either set of passages. The openings in the plug are so arranged that when the steam communicates with two passages one on each side of the cock, the other two passages are in communication with the exhaust pipe. A hollow groove is made round the plug which receives the steam at all times, and it thence passes into a chamber at the upper part of the plug. Two of the passages terminate in a bend to communicate with the outside parts of the two cylinders above the piston. The other two terminate in the mid ports placed directly below the lower ends of the cylinders. The invention may be applied to locomotive engines by having two pairs of cylinders connected end to end together, and the two pairs centred on the opposite ends of a hollow trunnion placed in sloted bearings provided with heliacal springs. Each cylinder has a separate piston rod directly connected to one of the four driving wheels. The steam pipe from the boiler to the trunnion is provided with a packed telescope joint.

[Printed, 1s. Drawings. See Mechanics' Magazine, vol. 49, p. 577, and vol. 50, p. 265. Artizan, vol. 7, p. 106. Patent Journal, vol. 6, p. 106. Engineers' and Architects' Journal, vol. 12, p. 24.]

A.D. 1848, October 19.—N° 12,293.

ASAERT, JOSEPH EUGENE.—" I combine two endless chains " or bands in such manner that one is caused to be moved by a " series of descending weights, and thus to obtain motive power " to axes from which motion is communicated to the second end- " less chain or band, which is so arranged as to convey the several " weights back to the higher position, and owing to there being " at all times a large number of weights descending and acting " at a greater leverage than there are weights ascending, and " which act at a lesser leverage, there will result a considerable " motive power." "The descending weights being at all times " more numerous."

[Printed, 3*s.* 4*d.* Drawings. See Mechanics' Magazine, vol. 50, p. 401. Patent Journal, vol. 7, p. 61.]

A.D. 1848, November 2.—N° 12,303.

TIBBITS, WILLIAM BULLOCK.—The first part relates to a rotary engine, consisting of a cylinder mounted on an axle, and working in a case of " the peculiar eccentric form shewn." Four leaves or pistons are hinged or jointed to ribs raised on the outside of the cylinder, each quarter of which is bevilled in such a manner that the steam has free access under the leaves or pistons, but is cut off as soon as these parts have completed their transit, and is thus made to act expansively during the rest of the stroke. After the piston has passed the eduction passage it is forced by a guide to recede into the hollow space between two ribs. By having two sets of pistons and ports, a double-acting engine may be formed on the same principle. " An air engine, to be worked " on either the exhausting or compressing systems may be also " constructed on the same principle as the preceding engines."

[Printed, 1*s.* 8*d.* Drawings. See Mechanics' Magazine, vol. 50, p. 428, 490, and 606. Patent Journal, vol. 7, p. 82.]

A.D. 1848, December 28.—N° 12,394.

KINSMAN, ISRAEL.—(*A communication.*)—Rotary engine, to be worked by steam, air, or other elastic fluid. The invention consists in giving in and out motions to the steam stops by a crank motion for each, the crank arbors being rotated by pinions turned by a cog wheel on the shaft. The piston wheel has the periphery

of a form generated by the motion of the stops and the rotation of the steam wheel. Secondly, in making the ends of the stops with toes, which embrace the sides of the piston wheel, and in fitting the ends of the stops in grooves, or otherwise to prevent the steam passing round the grooves in the packing ring. Thirdly, in combining with the piston wheel cut-off valves operated by toes on rock shafts. Fourthly, in having a continuous annular steam chamber at the side of the cylinder. A similar exhaust chamber is also made. Fifthly, in packing the engine by two metal rings, one on each side of the wheel; and, lastly, in packing the steam wheel by forcing a metallic ring against its face by a series of wedges moved in and out radially by set screws, which pass to the outside of the cylinder or case. The number of pistons may be five, or more or less, but must always exceed by one the number of stops.

[Printed, 1*s.* 10*d.* Drawings. See Mechanics' Magazine, vol. 51, p. 17. Patent Journal, vol. 7, p. 127.]

A.D. 1849, January 4.—N° 12,399. (* *)

MOAT, William Crofton.—" Improvements in engines to be " worked by steam, air, or gas." The invention relates to packing the pistons and stuffing boxes of such engines.

A hollow ring made of lead or vulcanized caoutchouc fits into a recess formed for it in the body of the piston, between a flat metal ring of the depth of the piston and the face of the cylinder. The elastic ring has a circular section, but when pressed into its recess it has a triangular section, two sides being in contact with the body of the piston and the outer side in contact with and pressing against the flat metal ring that forms the periphery or sliding surface of the piston. To regulate or increase the pressure on the latter, a passage is bored down through the piston rod, and terminates in another passage, which diverges at a right angle and ends in the hollow caoutchouc ring. Air is injected by a force pump through the passage in the piston rod into the cavity of the elastic ring, which presses outwards against the flat ring that is in sliding contact with the side of the cylinder. Instead of caoutchouc rings, short lengths of lead tubing may be used.

2. Describes several modifications of the apparatus.

[Printed, 8*d.* Drawings. See Mechanics' Magazine, vol. 51, pp. 37. Patent Journal, vol. 7, p. 138. Practical Mechanics' Journal, vol. 2, p. 129.]

A.D. 1849, January 20.—N° 12,429.

BOGGETT, William.—The second part of this invention consists in a "method of restoring to compressed air or other elastic "fluid, when employed as a motive power, the heat of which it "has been deprived by such compression, and thereby increasing "its expansive force. I employ for the purpose the heat gene-"rated by the slacking of lime with water, or by the mixture of "concentrated sulphuric acid with water, or simply that which "is evolved from hot air or oil." For this purpose there are two circular vessels the one placed within the other, and containing the lime and water or other heating substance. The air is made to pass between the vessels before going to the cylinder. Or the cylinder may be enclosed in a casing or jacket divided into two compartments, the outer one containing the heating substances.

[Printed, 10*d*. Drawing. See Mechanics' Magazine, vol. 51, p. 91. Patent Journal, vol. 7, p. 179.]

A.D. 1849, March 14.—N° 12,520.

BRAGG, William Allen.—Part of this is a means of applying the pressure of air to work an engine for propelling the main shaft of a steam vessel. There are two vacuum cylinders exhausted by means of a steam engine or other power, and two pistons and cylinders which work the shaft. Air pipes lead from the vacuum vessel to each end of the cylinders, and serve to exhaust one end, while by opening certain cocks in the pipes the air will rush along them to the other ends of the cylinders.

[Printed, 1*s*. Drawing. See Mechanics' Magazine, vol. 51, p. 284. Practical Mechanics' Journal, vol. 2, p. 191. Patent Journal, vol. 7, p. 260.]

A.D. 1849, March 20.—N° 12,531.

SIEMENS, Charles William.—"Improvements in engines "to be worked by steam and other fluids, and in evaporating "liquids."

These are, first, an improved condenser made on principles analogous to that of the regenerative engine, A.D. 1847, No. 12,006.

The second part of the specification describes an improved valve for distributing the steam or other fluid on leaving the cylinder of the regenerative engine, and for receiving the same back at proper intervals. It consists of a cast-iron casing with an internal cylindri-

cal surface containing twelve or other number of rectangular apertures, which communicate respectively with the regenerative compartments except two, of which one *a* communicates with the boiler and the other *b* with the condenser. The breadth of the apertures varies, the one nearest to *a* being the smallest, the next longer, and the one nearest *b* longest of all. Between *a* and *b* are two, and between the other apertures one groove, containing a strip of metal fitting steam tight and pushed against the periphery of a solid drum fastened on an upright shaft, on which is a conical wheel geared into two other wheels with twice its number of teeth. These wheels are free to revolve on, but sometimes partake the motion of, a shaft (which is moved by the engine, making two revolutions for one of the former). The periphery of the drum contains a rectangular aperture leading to the exhaust pipe of the cylinder. This aperture which formerly covered *a* begins to move round when the fluid has nearly completed the stroke of the piston or trunk, until it reaches *b*, where it stops until after the return stroke is nearly completed, when it moves back to *a* in the opposite direction.

And, thirdly, an evaporator also constructed on principles analogous to that of the regenerative engine.

[Printed, 2*s.* 10*d.* Drawings. See Repertory of Arts, vol. 20 (*enlarged series*), pp. 315, 333. Mechanics' Magazine, vol. 51, p. 287; vol. 56, pp. 81, 105. Patent Journal, vol. 8, pp. 53, 90.]

A.D. 1849, March 24.—N° 12,533.

MACKINTOSH, John.—The first part consists in arranging the furnace of a steam engine so that the expanded air and products of combustion give motion to a second engine. The furnace and ash pit must be closed, and supplied with air by a blower. The second part consists in giving motion to ships by forcing water out of tanks by the action of steam or other elastic fluid, such as air. The third part consists in propelling vessels and carriages by expelling air by means of high pressure steam. The sixth part consists of a cylinder fixed on an axis, and working within an outer cylinder having a weighted outlet valve. Two or more channels or passages pass from the axis towards a part of the periphery of the inner cylinder, and then by a bend pass out by another part of the periphery to the space between the cylinders. Steam or other fluid is admitted into the axis made partly

hollow, drives out steam of less pressure in the space between the cylinders and gives motion to the axis.

[Printed, 1*s*. 8*d*. Drawings. See Repertory of Arts, vol. 15 (*enlarged series*). p. 9. Mechanics' Magazine, vol. 51, p. 306. Patent Journal, vol. 8, p. 5.]

A.D. 1849, April 17.—N° 12,576.

REMINGTON, George.—The inventions described as being applicable to pneumatic engines are, first, converting reciprocating rectilinear motion into a continuous rotary motion by means of an axle with a stud passing through a pipe with a continuous groove, or through pipes cut into cylindrical wedges.

Secondly, communicating motion to the crank without the use of a hollow piston rod or trunk. In this case a vibrating rod is fixed to the piston, and passes through an opening or slit in the cover of the cylinder, while a flat plate or slide with a gland and stuffing box moves with the rod, so to close the slit. The connecting rod passes through the centre of a globe half let into the gland. Another way is by fixing the extremity of the rod to a box which slides between two plates of the piston.

Thirdly, a mode of forming a double engine by placing one cylinder within another. The outer cylinder has an annular piston with two connecting rods attached to cranks, and the inner cylinder a piston with a connecting rod to a crank on the same axis, but set at a right angle to the first cranks. A single engine may be formed in a similar way by admitting the steam or motive force only into the large cylinder. Four rods are attached to the annular piston and their extremities fastened to a ring, from which a pipe depends, and the piston to the small cylinder is fixed to such pipe.

[Printed, 2*s*. 6*d*. Drawings. See Mechanics' Magazine, vol. 51, p. 382.]

A.D. 1849, June 7.—N° 12,649.

HOUSTON, John.—Engine worked by steam and air conjointly.

The boiler is furnished with a number of tubes or other hollow apparatus, into which air is pumped. The air then passes into a vessel, to which the steam is also conducted which mixes with the air, and they together work the engine.

[Printed, 4*d*. No Drawings. See Repertory of Arts, vol. 25 (*enlarged series*), p. 112. Mechanics' Magazine, vol. 51, p. 572.]

A.D. 1849, June 7.—N° 12,654.

SMITH, Stanhope Baynes.—Depositing metals and obtaining motive power. The fifth part of the invention consists in "the "use of the hydrogen evolved from voltaic batteries for pro-"ducing motive power, by mixing and detonating the said "hydrogen with oxygen or atmospheric air."

[Printed, 4d. No Drawings. See Repertory of Arts, vol. 15 (*enlarged series*), p. 117. Mechanics' Magazine, vol. 51, p. 571. Patent Journal, vol. 8, p. 224.]

A.D. 1849, September 27.—N° 12,788.

MAILLARD, Nicholas Doran.—"Improvements in obtain-"ing motive power for giving motion to machinery and in pro-"pelling vessels."

[No Specification enrolled.]

A.D. 1849, October 18.—N° 12,815.

CAMPBELL, Ethan.—Obtaining and applying the vapor of alcohol and other like vapors as a motive power. A separate furnace is made to heat water which circulates over it and the flues leading from it, and then through pipes into and out of a boiler containing alcohol that does not mix with the water, where the water parts with most of its heat and then returns by a pipe placed below the furnace. The water space is provided above with a pressure cylinder, into which the expanded water and steam passes, whence it goes by a side pipe to the water space below the furnace, and a sufficient supply of water under pressure is thereby ensured to all parts of the water space. A dividing plate partly separates the hotter water above the furnace from the water below. The alcohol vaporized by the water passes to the working cylinders. The cylinders are each furnished with two piston valves on the same slide rod. By means of a latch striking against a fixed rod or lifted by pins working in grooves or otherwise the motion of the slide rod is arrested during part of the stroke, and one valve is left under the induction port at the half back stroke while the eduction port is left open, thus cutting off the steam. The exhaust pipes take the steam to the condenser which has a cylindrical outer metallic case and

concentric annular spaces for the reception of the vapor, between which a current of cold water flows (from outside the ship when the invention is applied to marine propulsion). After being condensed by this water or other convenient means, the liquid passes to a reservoir and thence to the feeding vessel, which it enters by a pipe at the highest part. This pipe has a second opening into the boiler, which is usually closed by a vertical sliding tube. As the vessel becomes filled with fluid a float is raised up and a guide rod fastened to it, aided at the last moment by the action of springs, suddenly raises the sliding tube so as to shut the passage to the reservoir and open that to the boiler. Steam then enters the feeding vessel and aids the liquid to force open a valve covering a third passage, and to escape into the boiler. The boiler is provided with a safety valve and steam gauge which, when the pressure becomes too high, allows the vapor to pass to the condenser.

[Printed, 2*s*. 8*d*. Drawings. See Mechanics' Magazine, vol. 52, p. 338. Patent Manual, vol. 9, p. 29.]

A.D. 1849, December 10.—N° 12,880. (* *)

DAVIES, Jonah, and DAVIES, George.—"Improvements "in engines worked by steam, air, water," &c., "also in boilers, the principle of which improvements is likewise applicable to "blowing air and pumping water." A steam chamber has the form of a portion of a sphere revolving on an axis passing through the centre, on which are keyed two conical ends that revolve in the steam chamber, and are connected by means of the piston, there being an opening through the moveable partition that revolves on its axis, for the passage of the piston; there being a spherical boss on the axis, which is in two halves, so arranged that the inner end of the piston passes between them, and comes in contact with the axis whilst on the opposite side, the boss has a tendency to expand within the central opening of the partition, by means of a spring and wedge, by which the steam is prevented passing from one side to the other of the piston. The partition is placed at an angle of about 60° with the axis. The steam passages are made in the conical ends on each side of the piston. The steam valve only requires to be changed in its position when it is desired to change the direction of the engine.

It is evident that by a slight modification this engine may become a pump for forcing water.

[Printed, 3s. Drawings. See Mechanics' Magazine, vol. 52, p. 496. Patent Journal, vol. 9, p. 129.]

A.D. 1849, December 15.—N° 12,889.

COWPER, CHARLES.—(*A communication.*)—This consists of "instruments operating by the changes of form caused by variations of internal or external pressure, however produced, in suitably arranged bent or twisted tubes whose transverse section is of a flattened form or of any form differing from that of a circle." Motive power may thus be obtained from the variations in the temperature and pressure of the atmosphere, and be applied to winding clocks and other purposes. This is effected by two flattened tubes bent into spirals, and acting by the motion of their free ends on a bent lever, at one of which is a sector working into a pinion which turns loose on its axis, and is provided with a pall which takes into a ratchet wheel with another pall to prevent its working backwards. The tubes are exhausted of air and contain a small quantity of ether. Another contrivance consists of a cylinder suspended by a cord to a wheel and balanced by a weight. The cylinder ends in a tube, the open end of which is immersed in mercury. A small quantity of ether is introduced above the mercury in the cylinder, and by its variations in pressure drives out or draws in mercury, thus alternately making the apparatus heavier or lighter, and turning a barrel of the wheel which moves in one direction only. Motive power is also obtained by the motions of a bent tube, into which steam is alternately admitted and condensed or discharged into the atmosphere. Here one end of the tube is free and acts on a crank by a connecting rod.

[Printed, 1*s.* 6*d.* Drawings. See Mechanics' Magazine, vol. 52, p. 496. Practical Mechanics' Journal. vol. 4, p. 220, and vol. 5, p. 142. Artizan, vol. 9, pp. 164 and 284. Patent Journal, vol. 9, p. 283, and vol. 12, p. 64.]

A.D. 1850, January 17.—N° 12,930.

COWING, HENRY.—"Improvements in obtaining motive power, "and in steam and other ploughs, in land carriages and in fire "engines, in raising water for draining and other agricultural

" purposes, and in apparatus for evaporating saccharine and other " liquors."

[No Specification enrolled.]

A.D. 1850, June 3.—N° 13,096.

FORD, GEORGE HAYWARD.—(*A communication.*)—Motive power is obtained by the revolution of a blower, composed of two conical discs, each with four fans radiating from the centre. One disc has a circular opening, behind which is a wheel or cylinder with " longitudinal openings in the sides, with ribs at each open- " ing placed at an angle of about 45 degrees inward from the line of " the periphery." The blower and cylinder are placed in a strong air chamber, having a division behind the blower, so that the only communication between the two compartments is through the blower and drum. Air is compressed into the chamber, and then is supplied from the compartment containing the blower to work an air engine, which causes the blower to revolve, and to throw the air from the first compartment (that containing the cylinder) by centrifugal force into the other or second compartment, making a difference of pressure between them, which serves to work the engine; but the power obtained from the velocity of the air being greater than that required to cause the blower to revolve, the excess it used to work a second and large engine by compressed air from the second compartment. The exhaust air from both engines is returned into the first compartment.

[Printed, 8*d.* Drawing. See Repertory of Arts, vol. 17 (*enlarged series*), p. 34. Mechanics' Magazine, vol. 83, p. 489. Patent Journal, vol. 10, p. 102.]

A.D. 1850, June 8.—N° 13,111. (* *)

FONTAINEMOREAU, PETER ARMAND, LE COMTE DE.—(*A communication.*)—" Improvements in oscillating engines put in " motion by steam and gas, resulting from combustion."

The boiler is divided into two compartments, having one common envelope or shell. The fire-place is surrounded with water, and also the smoke chamber, which contains the engine. The fire-door and entrance to the ash chamber are made air-tight by an asbestos matting.

An outer cylinder and an inner cylinder are placed concentrically, and the annular space between them forms a water chamber. A third cylinder is set concentrically within the other two, and

forms an annular chamber, which receives the smoke that has left the furnace; a fourth or innermost concentric cylinder encloses a third annular space, which is nearly filled with a "fusible metal." The furnace is supplied with fresh air from the ash-pit, and the gases are conducted from it into the second annular space, and the steam at a very high temperature, from the water, in the second annular space is allowed to mix with it, and by its heat the fusible metal is kept melted. The combined steam and gases at a very high temperature are then admitted into the innermost cylinder above one of the surfaces of the molten metal, and raises it on one side of the cylinder, which gives that side a preponderance, and causes by its fall the vessel to oscillate. The steam and gas are then thrown upon the opposite surface of the molten metal, which causes a second oscillation in the reverse direction.

The application of the engine to railways and steamboats is described, and also method of disposing the sliding valve in oscillating engines.

" Experience demonstrates that the motive power of gaseous " products generated by combustion, is for every pound of coal, " about three times larger than the corresponding steam power " obtained in a common generator. Or, if the power generated " by the combustion of the fuel be represented by 100, the cor- " responding steam power generated in the boiler will be 35, and " the force of the engine is 25 per cent. at the utmost, which loss " of combustible is 75 per cent. in the best engines yet known. " The flame in this engine acting conjointly with the steam allows " the boiler to be considerably diminished, and simplifies to a " great extent the whole of the machinery."

The valves and cocks of egress and regress, and various adjustments, are explained by drawings on a large scale.

The " quantity of the atmospheric air to produce by the com- " bustion the most useful and possible effect" is regulated by the suction of the engine itself.

[Printed, 2s. 2d. Drawings. See Mechanics' Magazine, vol. 53, p. 477. Patent Journal, vol. 10, p. 188.]

A.D. 1850, June 11.—N° 13,120.

VRIES, John Henry.—" First, I have discovered that by " allowing the escape of small quantities at a time of this highly- " compressed (atmospheric) air, and causing it to act suddenly " *and momentarily* upon any solid body, that it will, by its

" continued impulses, create a super power, that is, will create
" more than sufficient force than would be required to compress
" the same quantity of air suffered to escape into the same receiver
" at the same time.

" Second, by continually compressing more air into the receiver
" the elastic force is greatly increased by the retention of the
" heat developed during condensation.

" Third, that a great advantage is gained by drawing the air
" to be condensed from a height above the lowest stata, through a
" pipe of peculiar construction."

The compressed air is made to act either on a piston in a cylinder, or on a fan of a rotatory engine. Various forms of engines marine locomotive, and adapted for ordinary roads are described.

[Printed, 1*s.* 10*d.* Drawings. See Mechanics' Magazine, vol. 53, p. 496. Patent Journal, vol. 10, p. 138.]

A.D. 1850, July 15.—N° 13,174.

BOOTH, Tempest.—Motive power is obtained from the air supplying a furnace by a set of radiating vanes on a principle similar to that of a smoke jack or a revolving ventilator, and may be employed where a considerable speed but no great power is required in cases where a fire is also required, as in coffee roasting, bread and biscuit baking, the turning of reflectors in signal lights, and also (by applying the improvements to windmills or by the use of special furnaces) in driving machinery for spinning ropes, dressing grain, and other purposes. Several sorts of apparatus are described. In one the vanes are placed between an external and internal ring of iron or other material. The edge of the outer ring is made perfectly true so that the ring of vanes revolves in close contiguity to a stationary ring having a flange constructed to direct the rush of air to the vanes. The ring of vanes is placed near the periphery of a wheel or disk of metal or covered radiating arms. A circular casing conducts the air after acting on the vanes to the flue leading to the furnace. In another modification motion is communicated to a shaft from the vane wheel by a friction wheel or roller placed within and in contact with the lowest point of the internal ring of the vanes, and the air is taken by a funnel-shaped opening to the furnace. In other modifications a vane wheel or two such wheels revolve in separate circular casings and the air passes by pipes placed near the periphery. The vanes may be covered either by plates which can

be made to expand or pushed out from the central covered disc, or by rings having their larger diameter of various sizes so as to adjust the surface of the vanes to the amount of draught. Methods are also described of altering the inclination of the vanes either separately or simultaneously. The vanes may be curved and may be arranged in series of two or more rings.

[Printed, 1s. 6d. Drawings. See Mechanics' Magazine, vol. 54, p. 59. Engineers' and Architects' Journal, vol. 14, p. 88. Patent Journal, vol. 10, p. 190.]

A.D. 1850, July 31.—Nº 13,207.

GREENOUGH, JOHN JAMES.—"Improvements in obtaining "and applying motive power."

[No Specification enrolled.]

A.D. 1850, August 12.—Nº 13,220.

FRÈCHE, ARNAUD NICOLAS.—This consists in the creation of a principle of action of several levers producing by one another a progression of power. The machine may be composed of twelve rows of levers similar to those figured. The principal lever in the drawing is loaded and has between the weight and the fulcrum a band which unites it to the top lever. The top lever is attached between the attachment of the band and its fulcrum to the first multiplying lever which moves a sector placed on the opposite side of its fulcrum. The sector moves a pinion which moves the first cam. The cam gives the effect of the first multiplying lever to the second. There are a succession of similar levers, sectors, cams, and pinions. The last lever appears to be attached to the fulcrum of a rod or lever which at one extremity ends in a sector connected by wheel work with the principal lever and at the other extremity is attached to a rod working a crank on the driving shaft.

[Printed, 10d. Drawing. See Mechanics' Magazine, vol. 54, p. 137. Patent Journal, vol. 10, p. 258.]

A.D. 1850, October 3.—Nº 13,271. (* *)

BOGGETT, WILLIAM, and SMITH, WILLIAM.—Rotary engine worked by steam or other elastic fluid and also various applications of gas.

A cylinder closed at the two ends is mounted on an axle. A cylinder of much smaller diameter revolves eccentrically within

it, a guide arm projects from the smaller cylinder and works to and fro in a recess on one side of the cylinder, and a steam stop projects from the central shaft, and is enclosed within the smaller cylinder, with the interior surface of which it is kept in steam-tight sliding contact. Steam is admitted into the space enclosed by one side of the guide arm, and the line of contact of the cylinder and eccentric ring, and carries the steam stop and shaft along with it, and the rotary movement is initiated at the commencement of the next revolution. On the slightest farther angular movement the used steam escapes through the eduction passage, and a fresh supply is admitted at the induction orifice.

[Printed, 1*s*. 8*d*. Drawings. See Mechanics' Magazine, vol. 54, pp. 281, 299, and vol. 56, p. 41; Patent Journal, vol. 11, p. 12; Journal of Gas Lighting, vol. 2, p. 90.]

A.D. 1851, October 10.—N° 13,281.

FERNIHOUGH, WILLIAM FRANCIS.—Part of this invention relates to obtaining motive power by using the products of combustion from a close furnace and steam produced within it, in an impulsive rotary engine, of which the preferable form consists of two or more arms tapered from the spindle to the tips, revolving in a close circular case, which the æriform bodies enter by a jet in a tangential direction near the circumference and quit near the centre. The steam is produced by spray injected at the top of the furnace and heated by metal or fire clay bars above the fuel. Air is forced into the ash-box by a fan which delivers its air all round the circumference of the case by a narrow slit, thereby increasing the pressure by means of the centrifugal force of the revolving air. The æriform bodies may be used to produce power in a chamber similar to a gasometer, provided with a stuffing box to retain the water. The exit valve is sealed by the effusion of water at the time of closing.

[Printed, 10*d*. Drawing. See Repertory of Arts, vol. 17 (*enlarged series*), p. 278. Mechanics' Magazine, vol. 54, p. 318. Patent Journal, vol. 11, p. 23.]

A.D. 1850, December 12.—N° 13,410.

JOHNSON, WILLIAM BECKETT.—Improvements in steam engines, wholly or in part applicable where other vapours or gases are used.

These are employing in horizontal engines a condenser formed as part of the foundation plate, a parallel motion to guide the

piston rod, anair pump worked by levers fixed on the shaft and placed about the centre of the engine, a hot well forming a part of the foundation plate: also in employing in inverted cylinder engines a box framing circular in horizontal section having openings and being strengthened by ribs, a condenser and hot well forming part of the framing, a lever for working the air pump to which motion is given by connecting rods from the piston rod cross bar, slides or guides to guide the piston rod: also in the use of springs in metallic packed pistons and in metallic packed D valves, so arranged that the expansive power acts in a line constituting a chord to the circle of the piston or the arc of the back of the valve.

[Printed, 1*s*. 6*d*. Drawings. See London Journal (*Newton's*), vol. 41 (*conjoined series*), p. 258. Mechanics' Magazine, vol. 54, p. 499. Practical Mechanics' Journal, vol. 5, p. 179. Patent Journal, vol. 11, p. 158.]

A.D. 1850, December 26.—Nº 13,425.

DUNN, EDWARD.—"Producing motive power by dilatation or "expansion of certain fluids or gases caused by the application of "caloric."

There are two cylinders of unequal diameter, the smaller cylinder being the supply, and the lower and larger cylinder the working cylinder. They are both provided with pistons connected together by rods or braces, and a "heat intercepting vessel" is attached to the lower surface of the working piston. There is a heater or cylindrical vessel with an inverted spherical bottom heated by fire places placed below and by flues leading from them: and a second cylindrical vessel or receiver, and one or two regenerators or vessels of cubical form filled with discs of wire net asbestos and other mineral or metallic substances. In working the engine the air from the heater is allowed to press below the working piston, and force it and the supply piston upwards. The air above the latter is driven into the receiver and thence through one of the regenerators to the heater. The space below the working piston is then made to communicate with an exhaust chamber, and the piston descends by its own weight driving the hot air through the other regenerator to pass off through the exhaust chamber. At the same time a fresh charge of atmospheric air is admitted above the supply piston. When two regenerators are used, the connections must be reversed after about fifty strokes of the engines, thus allowing the hot exhaust air to pass through

the regenerator which has been before cooled by the air from the supply piston, and vice versâ.

When any medium but air is used, a pipe is made to pass from the exhaust chamber to the chamber of the inlet valve of the supply piston.

[Printed, 10*d.* Drawing. See London Journal (*Newton's conjoined series*), vol. 39, p. 253; vol. 42, p. 213; Repertory of Arts, vol. 18 (*enlarged series*), p. 93. Mechanics' Magazine, vol. 55, pp. 18 and 41. Artizan, vol. 9, p. 95. Patent Journal, vol. 11, p. 179.]

A.D. 1851, February 17.—N° 13,515.

BUCHHOLZ, GUSTAV ADOLPH.—The third part of this invention consists "in a machine constructed of such mechanical parts "that constant pressure being applied at two or more points, and "so that the lines of pressure shall give rotary motion to one "or more axes, the pressure shall remain stationary in position."

This is to be effected by applying constant forces to eccentric wheels in fixed directions. These wheels, of which there are two series with different centres must not be less than four in number, and will communicate their motion by means of gearing consisting of a number of toothed wheels and pinions to a central shaft. The constant force is derived from the compression of a spring, and is applied by a plunger or eccentric rod to the eccentrics. It is applied most advantageously in a line as nearly as possible at right angles to one passing through the centres of the eccentrics. Machines producing compound motion round an axis itself having a rotation around another axis, are made by combining three or more of the machines for producing simple motion, in which the required force is applied by straps, and the wheels of all are in gear with wheels fixed on the central shaft.

[Printed, 10*s.* 4*d.* Drawings. See Mechanics' Magazine, vol. 55, p. 158.]

A.D. 1851, February 18.—N° 13,516.

MASNATA, DAVID FERDINAND.—"A new mechanical system "with compressed air, adapted to obtain a new moving power."

[No Specification enrolled.]

A.D. 1851, March 31.—N° 13,577.

GWYNNE, JOHN.—Part of the Specification relates to obtaining motive power by centrifugal force. According to the first method the lower open end of a cylinder, furnished with a

piston, is inserted in a vessel of mercury. By the revolution of the vessel the mercury falls in the cylinder, and the air above the piston presses it down. After the motion ceases the mercury again rises and the piston is forced up, and thus gives motion to a crank. The vessel is attached to a drum which is at first made to revolve by a band driving a pulley connected with the drum by a shaft and bevelled wheels. The drum has grooves, into which ropes wind in opposite directions. The ropes are connected with the rods of two pistons working in cylinders, the air in which by its increasing density serves to stop the revolution of the drum at proper intervals. The second method consists of a centrifugal pump fastened on the top of a vertical pipe, within which is a screw. The action of the pump by tending to form a vacuum at the top of the pump draws up the mercury which is afterwards thrown from the pump and falls back into the lower case. The mercury in its constant ascent up the pipe presses against the threads of the screw and imparts power to keep up the revolution of the shaft and pump. In the third method the mercurial flow is made to actuate a piston working in a horizontal cylinder beneath.

[Printed, 3*s*. 10*d*. Drawings. See Mechanics' Magazine, vol. 55, p. 299. Practical Mechanics' Journal, vol. 4, pp. 107, 121, 126, and 147. Engineers' and Architects' Journal, vol. 14, p. 474. Patent Journal, vol. 12, p. 37.]

A.D. 1851, March 31.—N° 13,579.

BRUNIER, Louis.—"Obtaining power by the use of steam or "compressed air." The part relating to steam is not included in the Specification as filed, and was disclaimed by a disclaimer, dated 25th September 1851. The apparatus described consists of a large vessel with two ascending pipes communicating by a third pipe. The large vessel contains several small vessels, each provided with a valve opening outwards, and with a rising conical tube. The tubes communicate with boxes and with a vacuum vessel, and also with the third pipe, but the communication may be closed by valves. To start the engine compressed air is pumped into one of the pipes rising from the large vessel until a pressure of about an atmosphere and a quarter is obtained. Then on closing the valves in the tube through which the compressed air is forced, and on opening those in the tubes leading from the third pipe to the small vessels, and in the pipe to the working cylinder it will be found that a constant supply of com-

pressed air for the engine will be maintained in the large vessel. For the rush of air from the third pipe down the apparatuses on the tubes will cause a quantity of the outer atmosphere to be drawn in through openings in these tubes, and forced through the conical tubes into the small vessels.

[Printed, 10*d*. Drawing. See Repertory of Arts, vol. 18 (*enlarged series*), p. 287. Mechanics' Magazine, vol. 55, p. 299. Patent Journal, vol. 12, p. 39.]

A.D: 1851, May 8.—N° 13,625.

NEWTON, WILLIAM EDWARD.—(*A communication.*)—The second part of this invention consists in the employment of metallic packing for engines to be worked by steam, air, or gases, which packing is shaped and combined in a matrix or cup-shaped, and arranged so as to allow the piston rod liberty to vibrate laterally, to yield to the irregularities of the engine. This is done by rings of metal, which may be cut in one or more places, and which are ground to fit one another truly and together to form the frustum of a cone. Over these another ring is placed, upon which springs keep a suitable pressure, the effect of which will be to depress the packing into the conical-shaped chamber of the vibrating cup. The rings when worn are pushed onwards by the proper application of springs and screws so as to maintain a perfect contact.

[Printed, 1*s*. 4*d*. Drawings. See London Journal (*Newton's*), vol. 39 (*conjoined series*), p. 506. Mechanics' Magazine, vol. 55, p. 415. Patent Journal, vol. 12, p. 97.]

A.D. 1851, June 21.—N° 13,671.

FLETCHER, RICHARD.—" An improvement in obtaining motive " power."

[No Specification enrolled.]

A.D. 1851, October 9—N° 13,764.

LACKERSTEEN, JAMES FREDERICK.—In this invention carbonic acid gas is employed as a motive power. The gas is generated in a strong vessel, into which the materials proper for obtaining the gas are pumped from two separate reservoirs. Carbonate of soda and sulphuric acid are preferred. A percolator or vessel filled with small pieces of glass or other substances affording an extended surface for mixing the chemical materials

is placed in the generator under the double pipe, by which these materials enter. Below the percolator is a float to act as a valve in discharging the residuary liquid. The gas passes into a second vessel partially filled with water, by which it is purified, and thence into a third vessel, where it is heated by a jacket of hot air, water, or steam, or by electricity. From the third vessel the gas goes to the cylinder, and is afterwards partly absorbed by carbonate of soda, which is thus converted in the bi-carbonate vessel to supply the generator. A pump is used between the second and third vessels, which has two plungers, the upper worked by a crank and the lower by a cam fixed on the same shaft. The latter follows the upper plunger for some distance, and then remains stationary, while the upper plunger finishes its stroke and returns past the opening of the supply pipe. The lower plunger then recedes to a position at the opening of the discharge pipe. It is followed by the upper plunger which comes in contact with it at the end of its stroke.

[Printed, 10*d*. Drawings. See Repertory of Arts, vol. 19 (*enlarged series*), p. 296. Mechanics' Magazine, vol. 56, p. 317.]

A.D. 1851, October 23.—N° 13,786.

PAPE, JOHN HENRY.—"Ploughs." Part of the invention consists in a method of producing a moving power by gunpowder, gun cotton, or other substance. There is a small cylinder in the form of a gun barrel, in which passes an iron rod forming the piston. A small roller or valve passes through the cylinder and carries through a hole the necessary portion of gunpowder by a half rotation which is occasioned by the motion of the piston. The powder is exploded by a lamp directly it is thrown into the cylinder, and forces the cylinder out, making it meet the ground. as pieces of resistance. The piston is brought back by a spring. When it has been pushed out a side is attracted, and so turns the valve, which is moved back by a winding spring or other elastic substance. The valve fills itself from a powder box tightly covered with a thin piece of skin.

[Printed, 10*d*. Drawing. See Mechanics' Magazine, vol. 56, p. 358.]

A.D. 1852, February 12.—N° 13,965.

SCHIELE, CHRISTIAN.—The invention relates :—

First, to a species of turbine or rotatory cone wheel worked by the action of steam, water, or other fluid matter admitted by

a pipe into a cylindrical chamber, on the upper end of which is a flange, on which an open frame rests. A shell or hollow cone is placed within the cylinder, and contains a vertical duplex conical spindle, which is the moving portion of the machine. The lower end of the spindle, which is made up throughout of the anti-friction curve surfaces for which the Letters Patent, No. 12,338 (Old Law), were granted, rests in an antifriction bearing in the bottom of the shell, and the upper part is supported by a similar bearing in the top of the upper frame. The face of the lower cone of the spindle is formed with a series of differentially curved oblique ducts, revolving just clear of the interior surface of the fixed shell. The steam or other motive force, after filling the cylinder, passes into the narrow part of the cone or shell through a ring of inclined tapering tangential openings corresponding in number with the channels of the runner or spindle. The steam enters an annular space, and thence goes into the channels which are formed so that the steam enters them at its full velocity without any shock, and as the current enters in a nearly horizontal direction, it shall be smoothly conducted off its line to almost a right angle to its original direction, the speed being greatly reduced, and the current passing at a uniform rate. The channels are widened from their bottom upwards to an extent sufficient to allow of any practical expansion when an elastic body is used. The spindle is thus caused rapidly to revolve. The friction wheel surfaces and lubricating contrivance are on the principle described in the Letters Patent, No. 13,784 (Old Law).

The second part relates to a piston governor for engines. The pipe or duct is fitted with a throttle or other adjustable valve moved by means of a lever acted on by a piston. The position of the piston depends on the pressure above and below it. A fan revolving with the engine tends to form a vacuum above the piston, while a forcing or propelling action from the duct of a reservoir tends to produce a plenum beneath the piston.

The third part relates to transmitting power through pipes or fluid ducts; and the fourth part to the working of expansion valves by means of an adjustable pendulum action, whose oscillation, derived from eccentric action, gives an intermittent vibratory traverse to a gridiron expansion slide, the slide being left behind at the central portion of the pendulum's swing to an extent equal to the width of the steam ports in such slide. The

traverse of the valve is varied by raising or lowering the rod from which the pendulum is suspended.

[Printed, 1s. Drawing. See Mechanics' Magazine, vol. 57, p. 158. Engineers' and Architects' Journal, vol. 15, p. 315.]

A.D. 1852, February 12.—N° 13,967.

STEPHENS, JOHN.—" Improvements in obtaining and applying " motive power."

[No Specification enrolled.]

A.D. 1852, February 23.—N° 13,981.

BROOMAN, RICHARD ARCHIBALD.—(*A communication.*)— " Windmills."

A wind house, octagonal or other shaped, is raised on a platform erected at a convenient height. In it are " partitions by " which the wind blowing against the side of the wind house is " directed into the interior. The partitions are placed tan- " gentially to the circumference of the revolving part of the " mill." This consists of circular rings to which curved blades or vanes are attached. Doors in the partitions " serve to close " the ends of the passages between the compartments, and " prevent the wind from obtaining access to the interior of the " mill when it is not required to be at work. Three sides of the wind house are exposed to the prevailing winds which are deflected by the partitions, and made to strike against the vanes or blades. When " employed on board ship it will be better to " dispense with the employment of the wind house."

[Printed, 8*d*. Drawing. See Mechanics' Magazine, vol. 57, p. 196.]

A.D. 1852, March 8.—N° 14,016.

SLEIGH, WILLIAM WILLCOCKS.—" A counteracting reaction " motive power engine."

[No Specification enrolled.]

A.D. 1852, March 24.—N° 14,031. (* *)

TARDY DE MONTRAVEL, ANTOINE MAURICE.—" Improve- " ments in obtaining motive power."

Motive power is obtained from the expansion of compressed air by heat. A " double-acting apparatus cylinder " is filled with air, compressed by a force pump, of equal density on each side

of the piston. The cylinder being heated and cooled alternately on each side, the difference of expansion will serve to elevate and depress a piston alternately and produce a powerful mechanical effect.

The following are the main features described:—"A con- " trivance to prevent the caloric radiating from one extremity of " the cylinder to the other." A method of making pistons air tight, by the interposition of a liquid between the condensed air and the piston. Air-tight bags enclosed in cylinders without pistons. One part of a double cylinder is made to close in the other; a tube or lining of elastic waterproof material is made of the shape of the cylinder, and fixed to the bottom of the two cylinders. The air condensed by a force pump forces the elastic tube against the interior faces of the cylinders. When the bottoms are distant from one another the tube is stretched, but when they are near the lower one rolls itself up, and thereby doubling its thickness forms an effectual air-tight junction between the cylinders. Pistons are dispensed with, and the motion is transmitted outside from the bottoms of the cylinders, connected by rods to intermediate mechanism. An arrangement distributes the heat and cold alternately round the cylinders. Two modifications of the preceding combination are described.

A rapid transition from heat to cold may be produced by the introduction into the annular space of a boiling liquid, followed by a cold liquid. The two extremities of a cylinder may be alternately heated, and the flame will circulate in the annular space, and the exterior cylinder will serve as a safeguard and concentrator of the heat. Or a fire-grate may contain a spirituous liquid, and be suspended to the exterior cylinder, and conveyed alternately from one end to the other. The closed cylinder may be filled with air condensed under a pressure of two or three atmospheres, and the piston fixed immoveably in the ground; and if it be exposed to the rays of a burning sun, or if the solar rays be intercepted by a curtain or screen, great effects may be obtained in raising water. A system of antagonist cylinders may be adopted. A half-circular plate may be placed round each cylinder, to reflect back the sun's rays, by a mirror or blackened surface, or they may be made to pass through plates of glass. The circular reflector may turn on a pivot, so as always to have the side of the cylinder to the sun. A constant temperature of 100° may be obtained. By throwing water against

the cylinder it will be vaporised, and a power obtained equal to that of furnaces consuming a large amount of fuel.

[Printed, 8d. Drawings. See Mechanics' Magazine, vol. 57, p. 229. Engineers' and Architects' Journal, vol. 15, p. 394.]

A.D. 1852, April 24.—N° 14,086.

HASELTINE, SAMUEL, the younger. — "Improvements in "engines to be worked by air or gases."

[No Specification enrolled.]

A.D. 1852, May 22.—N° 14,134.

BAINBRIDGE, EDWARD THOMAS. — "Improvements in obtaining power when fluids are used."

[No Specification enrolled.]

A.D. 1852, July 31.—N° 14,246.

WICKENS, HENRY.—(*A communication.*)—" Improvements in obtaining motive power.

[No Specification enrolled.]

A.D. 1852, December 8.—N° 14,351.

GORMAN, WILLIAM.—The invention relates, first, to employing the heat which ordinarily passes off as waste to heat the air which passes into the furnace for the support of the combustion. This is effected by forcing the cold air to circulate in a series of pipes between the interstices of which the heated escape gases pass. The air to be heated enters at the furthest end from the furnace so as to take up more heat as it approaches.

Secondly, to the interposition of iron fire clay or substances capable of acquiring a high temperature between the flame and the boiler.

Thirdly, to superheating steam.

Fourthly, to a rotatory engine or wheel driven by steam, water, air, or other motive agent. The agent is conducted to the blades or vanes by suitable channels at or near the periphery of the wheel, and is impelled towards the centre. The vanes and passages are formed so that after the outer ends of the vanes which revolve at the highest velocity have received the effluent stream, the vanes gradually absorb the maximum of the power

and the agent leaves the wheel at its centre where the suction is almost *nil*. The wheel must be enclosed in a shell when uniform bodies are used.

Fifthly, to the transmission of force by a modification of the rotatory wheel which is now made to revolve by a prime mover, and the æriform body entering at the centre passes off at the periphery whereby pneumatic pressure may be kept up within a range of pipes or receivers.

[Printed, 8*d*. Drawing. See Mechanics' Magazine, vol. 58, p. 496. Engineers' and Architects' Journal, vol. 16, p. 248.]

PATENT LAW AMENDMENT ACT, 1852.

1852.

A.D. 1852, October 1.—N° 114.

JENKINS, George.—(*Provisional protection only.*)—"Atmo-"spheric engine." A large air vessel, having contracted ends or necks open at the top and bottom, passes through a close stove. In this air is heated, and issues at the top through tubes whose sides are perforated with small holes. These tubes pass through a box connected by a lateral pipe with a cylinder in which a piston works. Channels for the air, and for the exhaustion from the cylinder, to be opened and closed by a side valve in any ordinary or convenient manner, are formed. The air is exhausted on one side of the piston by being continually drawn through the lateral pipe into the box containing the perforated tubes, and the atmospheric pressure, alternately below and above the piston, will be enabled to produce the reciprocating action, as in other atmospheric engines. The effect may be increased by forcing air or a jet of water at the lower part of the air vessel.

[Printed, 4*d*. Drawing.]

A.D. 1852, October 2.—N° 149. (* *)

WHELE, Edwin.—(*Provisional protection only.*)—"Rotary "engine to be worked by steam, air, or gases."

Triangular cells or cavities are formed in the rim of the wheel, and enclosed on all sides, except at a narrow orifice across the periphery of the wheel that opens into the case in which it revolves. In their revolution these orifices cross the opening of a pipe from the boiler, and the steam entering each cell as it passes gives a rotary motion to the engine.

The opening to the cells may be formed on the side of the wheel, instead of on the face.

[Printed, 6*d*. Drawing.]

A.D. 1852, October 2.—N° 188.

WEEMS, John.—Motive power is obtained by elevating ponderous matter, which may be a series of heavy balls or a curved weight, or consist of water, mercury, or other fluid, in the interior of a hollow annular chamber or wheel so as to cause the rotation of such wheel by steam, air, water, or gaseous pressure. In one modification the chamber is made with a single fixed diaphragm. Steam enters on one side of the diaphragm and drives water or other heavy matter up to the other side, the steam from which escapes to the atmosphere or condenser. The diaphragm is thus impelled to one side, and by allowing the steam to escape and enter at each side alternately a reciprocating motion is obtained. In another modification there are three sliding abutments, each having two hollow spokes corresponding to it, one opening on either side. These spokes act as inlet and outlet passages. The traversing weights tend to occupy the lowest part of the wheel, but are forced up on one side by the steam, compressed air, gas, or other actuating power filling the greatest part of the space between the first and third abutments, the intermediate one being open to allow of a free passage along the chamber. In this way an unbalanced leverage is produced which causes the wheel to revolve, and the effect is aided by the pressure on the first abutment. A single valve covers both the inlet and outlet passages. Instead of abutments four-way cocks may be used. The same principle may also be applied to work an engine consisting of a hollow drum with closed ends, and with a series of differential or plain screw division blades forming spiral passages

or chambers, across the periphery of the drum, one end being open to the atmosphere. The drum is fast as a horizontal shaft and half immersed in mercury or other fluid. Suitable provision is made for the entrance and exit of steam or other motive matter which enters each spiral passage, and forces round the drum.

[Printed, 1s. Drawings.]

A.D. 1852, October 4.—N° 199. (* *)

BATES, Edwin.—(*Letters Patent void for want of Final Specification.*)—" Certain improvements for deriving motive power from " expansive fluids, and the better application and economy thereof " for propelling ships and other vessels in sea, river, and canal " navigation; also in the shape and action of wind-sails, the use " of water as a motive power for driving machines, mills, &c., the " construction of turbines, air and water pumps, marine pumps " for emptying ships of bilge water, and other useful purposes."

These improvements consist of a machine or instrument based on sound geometrical principles and constituting a propeller. " I " compose the centre of my propeller of a ball, or globe, or " cylinder, from which radiate one, two, three, or more arms or " blades, so shaped as to throw the water or other medium in " which the propeller acts into and against or around the globe, " whereby I gain the full propulsive effect due to centrifugal " and centripetal forces."

[Printed, 4*d.* No Drawings.]

A.D. 1852, October 5.—N° 223. (* *)

HOUSTON, John.—(*Provisional protection only.*)—Obtaining motive power.

"The invention consists, firstly, in the withdrawal of com- " pressed air and steam from a cylinder, in which they have been " conjointly used for the obtainment of motive power by means " of a partial vacuum, prepared in a peculiarly constructed vessel, " having several compartments; secondly, in the condensation of " the whole or part of the steam by the action of the compressed " air when allowed to expand in such vessel; thirdly, in a rotary " motion applied to the vessel or condenser, by which motion " each compartment is enabled to be alternately charged and " exhausted; and, lastly, in the combination of a spring valve " with the pump, by which the air is compressed before mixing

" with the steam, so that the same operation which causes the " compression of the air may also enable the whole or a portion " of the supply of such air to be obtained either from the con- " denser or from any other vessel in which it is desired to create " a vacuum."

[Printed, 4*d*. No Drawings.]

A.D. 1852, October 7.—N° 283.

GREAVES, THOMAS.—Motive power. On a foundation stone rest two pedestals supporting a centre shaft, which carries a beam. Two shafts are placed across the beam, each projecting a few inches beyond the end of the other on one side. Weighted pulleys are fixed to the shafts. The weights are disposed so that when the weighted side of one pulley is in a straight line upwards, that of the other is in a straight line downwards. These sides continually meet in a horizontal line, and depress the lever on the end where the weighted side of the pulleys are on. To make the machine self-acting, a wheel, moved by water, metallic balls, or other weights, is connected with it in such a manner that, when the wheel revolves, the pulleys do also. Water may be thrown up by pumps worked by the machine, a portion being allowed to pass upon the water wheel, and the remainder applied to turn a shaft, or in any other convenient manner.

[Printed, 10*d*. Drawings.]

A.D. 1852, October 9.—N° 326.

SIEMENS, CHARLES WILLIAM.—"Improvements in engines " to be worked by steam and other fluids."

The chief part of these "consists of combining a working " cylinder, which, with its working trunk respirator, plates, and " heating apparatus, is similar to the working cylinder of the " regenerative engine," [(p. 129, No. 12,006, Old Law) "with " another cylinder, which, by the motion imparted to the piston by " means of a crank standing in an angle of 90°, or thereabouts, " in advance of the working crank, assumes the functions of the " regenerative vessels and compound valve of the above-named " engine of alternately charging and discharging the working " cylinder." The improvements consist, moreover, in a peculiar arrangement of heating apparatus, and in certain methods of *governing* the power of the said engine.

The engine may be worked by air or by gas, in which case the cylinders and trunk must be cooled by a stream of water or air, or it may be worked by both air and steam either by forcing small quantities of air into the cylinders, or by introducing jets of water into the current of air entering the respirator plates which occupy the annular space or heating chamber formed round the working cylinders. The air will then assume the double function of first converting the water into steam, and immediately afterwards raising the temperature of the steam, and in its return of first cooling and then condensing the same. Vapors of a lower boiling point, as chloroform, sulphuretted carbon, may be introduced in a liquid form with the steam.

[Printed, 1*s.* 2*d.* Drawings.]

A.D. 1852, October 15.—N° 397 (* *).

MOSELEY, Henry.—(*Letters Patent void for want of final Specification.*)—Rotary machine capable of being used as a meter, a pump, or a motive power engine.

The inner cylinder is stationary and solid, the outer revolves and is hollow, and both have the same axis, which is hollow and divided by a diaphragm. On one side of this division the steam or other fluid is admitted into the annular space or piston chamber. On the opposite side the space is open to the exhaust orifice. Two recesses or slots are formed in the sides of the outer cylinder, from which two rectangular pistons slide outward across the piston channel into sliding steam-tight contact with the convex surface of the inner cylinder, and are withdrawn again into their slots when they have to pass over the edge of the fixed partition or steam abutment. The working steam or other fluid is admitted into the spaces formed by the revolution of the pistons between the face of a piston and a side of the steam abutment.

Both cylinders may be made to revolve in opposite directions with the opposite pressure, and the engine receive twice the amount of motive power, and yield twice the work. Several methods of packing the various parts of the machine to diminish the power absorbed in moving the slides are described. In a modification of the engine the fluid is admitted at the periphery of the hollow cylinder.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1852, October 16.—N° 410.

FAULKNER, Lot.—(*Provisional protection only.*)—Motive power is obtained from a beam, one end having a fixed weight, and the other end two levers mounted on studs and connected by gearing so as to revolve in opposite directions, and always counterbalance each other. Weights are placed on the levers. Where the levers are in a straight line perpendicular to the beam, and one above, and the other below the beam, it will be balanced, but if the levers are brought into a line with the beam, the weights being nearer the centre the fixed weight will outweigh the moveable ones, and on the levers making half a revolution more, the moveable weights will outweigh the fixed weight.

[Printed, 4*d*. No Drawings.]

A.D. 1852, October 30.—N° 577.

CROWTHER, John, and TEALL, William.—In this invention motive power is produced in the following manner:—

A cylinder fixed to a frame has two pipes communicating with its interior, and leading to two strong metallic air vessels. One of the pipes has a valve opening inwards to the cylinder, the other a valve opening outwards from the cylinder. An axle moved by a bevel or spur wheel is placed in the position of the axis of the cylinder. To this axle is fastened a flexible strap or metal chain with its interstices filled up, which passes out of the cylinder by an aperture in the cylinder parallel with the axis, and is fastened at the end to a metallic bar or piston, rather larger than the aperture, and working in an air box whose length is equal to that of the chain added to twice that of the piston. "The length of the strap is such as when wound on the axle in the "cylinder aforesaid, the last portion shall come and be in contact with the minor (inner?) and upper part of the circumference of the cylinder. At the other end of the metal box is "an appa-"ratus in every respect the same as herein-before described." The bevel or spur wheels of the cylinders are connected by a shaft so that as the strap is withdrawn from one cylinder, it is wound into the other. "Now the engine being in the first "instance moved a few strokes of the metallic piston so as to "charge one and empty the other air vessel (nearly) a com-"munication between these vessels and the cylinder of the ordi-"nary engines now in use is to be opened, when the compressed

"air will act on the piston of the engine, propelling it up and "down in the usual manner of steam; or by a connecting "vacuum vessel alternately with the top and bottom of the "engine cylinder, and by exposing the opposite sides of the pis- "ton to the pressure of the atmosphere the motion will be con- "tinued as in the ordinary atmospheric steam engine. In the "latter case the air drawn from the vacuum vessel being driven "into the atmosphere by the metallic chain or strap before "described, and in the former case the air having propelled the "piston will escape into the vacuum vessel before described, to "be again withdrawn by means of the metallic chain or strap, "and compressed as herein-before described."

[Printed, 4*d*. No Drawings.]

A.D. 1852, October 30.—N° 582. (* *)

SINCLAIR, James.—Oscillating engine worked by steam, air, or water, the improvements being also applicable to pumps.

The cylinder oscillates upon a fixed journal centre at its lower end. The journal or trunnion is hollow, and cast with an internal angular division, forming an isolated chamber from end to end, or an open thoroughfare, with two lateral apertures, as ingress ports from the trunnion valve to the cylinder. The remaining portion of the hollow forms a similarly continuous chamber open at its inner end to the exhaust chamber. "The "whole action of the engine may be performed without the use "of further mechanism, the requisite changes of position of "the working parts being effected by the mere oscillation of the "cylinder consequent on the traverse of its piston causing the "revolution of the crank."

It is entirely automatic, and may be worked as a hydrostatic engine by water from an elevated reservoir at a very rapid rate without jar or vibration, and it answers as a pump or as an exhausting apparatus.

[Printed, 8*d*. Drawing.]

A.D. 1852, November 1.—N° 601. (* *)

JEFFREYS, Julius.—(*Letters Patent void for want of Final Specification.*)—Engine worked by vapour of water, ether, spirits of wine, or ammoniacal vapours.

Two vertical columns are placed side by side, having no communication, but each at its summit is connected with the working

cylinder by a tube entering it, one at top and the other at bottom. Each vertical column has a small cylinder that projects its piston downwards, and contains a few pounds of water; over this cylinder is a head, with 20 or more small tubes from 6 to 30 inches long; over these, and communicating with them, is a "conducting apparatus," formed of a series of fine metallic passages, one or more feet in height, and in the diameter of their base. Above these passages are vertical tubes, receiving heat from a furnace at top through a fluid bath, the tubes beneath the metallic series being kept cold by the water surrounding them; the upper tubes terminate in a small chamber or head, which proceeds from the pipe connecting it with the main cylinder.

The piston being forced up injects the water through all the passages of the metallic series; its summit receives heat from them, and passes into vapour, while the bulk of the water acts as an incompressible ram, and its lower part remains cold; on ascending from the metallic conductors the vapour from the heating tubes becomes exsiccated, and entering the main cylinder drives its piston to the opposite end; the water pistons being now liberated below, the steam acting from above forces it and the column of water down, and is itself condensed on returning through the metallic series, to which it gives back some of the heat it received from them, with the small additional portion it required in the exsiccating tubes in going and returning from the main cylinder. "From its thus drawing in again and again per-" petually the same vapor and heat, it is named the respiring " engine."

[Printed, 4*d*. No Drawings.]

A.D. 1852, November 2.—N° 613. (* *)

BIANCHI, MAURIZIO. — (*A communication from Augustino Carrosio*).—(*Provisional protection not allowed.*)—" Improvements " in electro-magnetic apparatus for generating gas, applicable " for motive, lighting, and heating purposes."

"The nature of the invention consists in certain new arrange- " ments and combinations of electro-magnetic apparatus for the " decomposition of water, whereby a rapid and continuous supply " of gas is generated, which, applied to an engine almost similar " in construction to the ordinary steam engine, produces an " efficient motive power; it forms also an excellent lighting and " *heating gas.*"

[*Printed, 4d.* No Drawings.]

A.D. 1852, November 11.—N° 706.

LUEDEKE, Ernst.—(*Provisional protection only.*)—" I intend " by use of a pendulum, double wheel, and springs, to produce " vibration; such vibration being first produced by the springs, " and kept up by the concurrent action of the pendulum, wheel, " and springs, which reciprocate, or, in other words, give and " receive impulsive power from each other, thus producing a " motion that will continue so long as the whole of the impulsive " parts continue unbroken, or be not displaced, or are not worn " out by friction."

[Printed, 4*d*. No Drawings.]

A.D. 1852, November 17.—N° 776.

BRESSON, Francis.—Propelling on land and water. This is done by applying the power of reaction or recoil, according to the following principles:—First, that the velocity of the re-acting fluid be double the speed to be given to the body to be moved; and, secondly, that the flow of such fluid take place under the smallest possible resistance, in the open air, or very slightly under water. To produce a large propelling force it is necessary to use the densest fluids. In the first engine described a piston is worked in a cylinder by steam, and works a rod which is joined to the rods of air pumps with double action. The air passes from the reservoir into a heating chamber, where it raises its own temperature and aliments the combustion. After passing through the fuel and trebling its volume without increasing its elasticity it egresses through an opening, and by its continual flowing produces reaction and effects propulsion. In another engine water or a denser liquid is used, the upper part of the reservoir containing air to insure a uniform egress. In boats a piston and cylinder is placed outside the stern of the boat, and the rod of the piston is attached to the piston of another cylinder in which steam acts. In another form the reacting piston is given a continuous circular motion, and a valve which is withdrawn to allow it to pass is placed between the opening for the introduction of water and the egress.

[Printed, 10*d*. Drawings.]

A.D. 1852, November 22.—N° 813.

WEEMS, John.—" Obtaining motive power." The rim of a large wheel is furnished with a number of tubes which " form

" a double ring all round the wheel, each tube being made up " of a series of lengths jointed together by screwed union pieces " which answer as the receptacles for clock valves, the whole set " of valves being set to open in one direction." One side of this wheel is heated by a curvilinear flue from a furnace, while a little further forward is a cold meter or other condensing apparatus. The hollow tubes are partially filled with mercury or other ponderous matter and exhausted of air as far as possible. The air left after exhaustion in the heated sections of the tubes becomes expanded, and the vacuum formed in the cooled sections elevates the ponderous matter in the direction in which the valves permit it to pass, "and thus the contained weight in the rim " is constantly drawn up to one side and keeps up a perpetual " revolution of the wheel."

[Printed, 8*d*. Drawing].

A.D. 1852, November 26.—N° 887.

WOOD, Thomas.—Motive power is obtained by means of a wheel, whose shaft moves to and fro on fixed parallel bars. When the machine is set in motion a weight, which is drawn up, is set at liberty and acts through a pulley and crank rod on the wheel, which is thereby pressed against water confined in a box or case. The wheel and box then moves forward on a horizontal foundation plate and the other end, of the case, which is connected by a rod and lever to another weight, draws it up. The operation takes place alternately at each end of the machine as the weights by ascending and descending act on the wheel. The box is supplied with water by force pumps at each end, or by the weight of a column of water in a pipe.

[Printed, 8*d*. Drawing.]

A.D. 1852, November 30.—N° 921.

FITT, George.—(*Provisional protection only.*)—Motive power is derived from a circular half wedge, which revolves on its axis and comes in contact with a roller running on a keyed bolt working in a grooved socket; the key fitting the groove to prevent the bolt turning in the sockets, to which two rods are attached. The roller in contact with the wedge (whose motion is the same as that of a worm) is carried forward with the socket, and one rod thereby receives a stroke and gives half a turn to the cranks. The roller is then thrown out of gear, and the wedge by its second revolu-

tion carries forward a second roller and socket to complete the revolution of the crank. The crank acts on a spur wheel and pinion, and thus on a second wedge; half the velocity of starting is lost by the peculiar action of the wedge; but is recovered to the second wedge by the pinion, which is half the diameter of the spur wheel. From the principle of the inclined plane, whose power is as great as its length exceeds it weight, the power at the point of contact of the rollers may be three times that giving motion to the wedge. Half of this power is given up according to the law of the lever, that in proportion as we give up power we recover speed. There is thus a gain of half the amount of power with which the machine was started.

[Printed, 10*d*. Drawing.]

A.D. 1852, December 1.—N° 928.

MORRIS, William.—"Production of motive power." A reservoir is filled by means of an air pump with compressed air, by which the pistons of two cylinders on the plan of the common steam engine are worked. The piston rods by means of cranks turn an axle, and the motion of this axle is communicated by spur wheels to another axle parallel to and lying over the first. The upper axle, by means of cranks, works the pistons of two double acting air pumps. A constant supply of compressed air is sent from these air pumps to the reservoir.

[Printed, 6*d*. Drawing.]

A.D. 1852, December 3.—N° 940.

SEWARD, Noble.—Motive power is obtained from air compressed into an air-tight chamber by the action of the flow of the tide or fall of water. For this purpose a series of air chambers are made which communicate with each other, and are placed at low-water mark. The tide or water is allowed to flow into the chambers, so that the air which previously occupied all the chambers is forced into the upper part of the last chamber. The compression of the air may be aided by gunpowder or other combustible matter or gas being exploded in the chambers. The compressed air is forced into a reservoir or hot air chest to which heat is applied, and the heated air is applied to work machinery.

[Printed, 8*d*. Drawings.]

A.D. 1852, December 6.—N° 979.

QUARTERMAN, WILLIAM.—(*Provisional protection only.*)—
" Eliciting the gas concentrated in nitre and sulphur, and which " is entitled a gaseous engine." "The gas concentrated in nitre, " sulphur, and gunpowder, and also gun cotton, or any other " detonating substance" is elicited by compressed air or by a spark, and used for producing motive power upon a piston, as in the ordinary steam engine.

[Printed, 4*d*. No Drawings.]

A.D. 1852, December 16.—N° 1083 (* *).

SLATE, ARCHIBALD.—" Improvements in the production of " motive power from elastic fluids."

A hollow horizontal spindle works within another hollow spindle, which carries two hollow arms like those used in reaction engines. One or more perforations are made in the internal spindles which correspond with perforations in the other spindle. The radiating arms join in the centre, and in their rotation are brought opposite the perforations in the other spindle, and the steam or gas flows from them into each hollow arm as it passes in its rotation, imparting a continuous rotary motion. The movement of the mechanism is reversed by the ordinary method of opening a discharge pipe in the contrary direction.

[Printed, 6*d*. Drawing.]

A.D. 1852, December 24.—N° 1163.

NEWTON, ALFRED VINCENT. —(*A communication.*)—Motive power is obtained from the pressure of a weight or lever causing one or more wheels, rollers, or pulleys to rotate. In the application to propelling carriages the principle practically consists in applying to the shaft to be driven the force obtained from the weight of the carriage at an angle to the vertical. Several applications of the invention to propulsion are described in which, when a motive power is applied to draw the carriage in any direction, the axle of the running wheel moves up against one of two horns of a guard plate, and thereby a plane wheel or anti-friction, roller supporting the carriage is caused to be continually acting on the axle and turning it round. When the axle is vertically under the roller, no propelling force in either direction is produced. The motion may be stopped by pulling the axle back by means of

a lever. In stationary engines the motive power is obtained from a heavy roller made to rotate on, or in contact, with the periphery of the fly wheel. The axle of the roller is supported at its extremities upon rotating platforms, which being inclined to the horizon, the roller has a continual tendency to rotate in one direction and cause the fly wheel to rotate in the opposite. This wheel may also have its axle supported on rotating platforms, which must be inclined in the opposite direction to those supporting the roller.

[Printed, 1*s.* Drawings.]

A.D. 1852, December 29.—N° 1189.

GLORNEY, Benjamin.—(*Letters Patent void for want of Final Specification.*)—The invention consists in obtaining motive power by the weight of a moving carriage made to traverse backwards and forwards along a railway mounted on a centre, or pivot, or otherwise arranged so that the weight of the carriage may communicate thereto a vibrating or rectilinear motion, which may be communicated to the machinery to be driven.

[Printed, 4*d.* No Drawings.]

1853.

A.D. 1853, January 3.—N° 12.

CHAMEROY, Edme Augustin.—Motive power is obtained from the vapour of ether, chloroform, or other similar substances acting in a long cylinder and displacing a heavy piston altogether disconnected with the outside. The cylinder is suspended midway between its extremities in fixed bearings, and is provided at each extremity with a metal chamber or generator containing ether or other liquid easily vaporised. The lower generator is brought into a reservoir containing hot water or melted lead, by which the ether is vaporized, and acting on the piston drives it to the other end of the cylinder, which by its weight is then depressed. The other generator is thus brought into the heated liquid, while the first is carried upwards to a refrigerator consisting of a grooved roller covered with felt, cooled by cold water. The vapor in this generator is thus condensed while the ether in the other is being vaporized. Water, mercury, or other liquid may be

substituted for the piston. Instead of the two chambers, which serve as generators and condensers, there may be substituted a fixed generator and a fixed distinct condenser, with proper tubes communicating with the cylinder, so that the vapor is continually admitted below the piston. The condensed liquid is pumped back into the generator.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1853, January 5.—N° 20.

NEWTON, William Edward.—(*A communication.*)—" At-" mospheric engines." In these engines a receiver filled with highly-compressed air is kept at about a temperature of 480 degrees, or that amount above the temperature of the air. The heated air is transmitted into a cylinder with supply and cut-off valves, and operates a piston working in the cylinder. Motion is by this means communicated to a shaft and crank, which drives the piston of an air pump, and a quantity of cold air is thereby forced through a bent tube, which communicates with both ends of the pump into a long cylinder filled with pipes that are kept warm by the hot exhaust air passing round them. The compressed air from the air pump passes through these pipes into a coiled pipe or heater, and thence into the air receiver. The conical pipe and receiver are kept at the temperature required. In engines which it is desirable to work at a very high pressure, the hot exhaust air instead of being discharged into the atmosphere after passing into the long cylinder filled with pipes, air is conducted thence by a pipe passing through a cold water tank to a reservoir from which the air pump is supplied. The pressure in the heated receiver is regulated by a tube passing from it, and terminating in a cylinder in which a small piston works. When the pressure is sufficient the piston moves a rod, usually kept in its place by a spring, or its equivalent, which opens a valve in the air pump. Each of the tubes conveying the air from the pump to the receiver is furnished with a valve, dish-shaped or concave on the surface nearest the air pump; the two edges of the said surface are brought to a point or a very thin edge, so that the valve will require a very small seat or bearing, and from its peculiar shape will expose the same or about the same surface to the pressure of air in the air pump as is exposed to the back pressure from the receiver thus forming a balance valve.

[Printed, 8*d*. Drawing.]

A.D. 1853, January 5.—N° 21.

PASCAL, JEAN BAPTISTE.—The invention is the employment, as motive power, of a combination of "steam, air, and gases pro- "duced by combustion under a pressure of several atmospheres "dilated by means of a closed fire-box in which the fire is kept "ignited by air compressed at a pressure equal to that of the said "mixture, and supplied by a blow pipe." The fire is supplied with air for combustion by a tube into the ash-box, and a second tube introduces air not intended to assist combustion above the ash-box. A tubular apparatus is fitted to the furnace, by which a portion of the heated air is conveyed through pipes in the boiler to a pipe joining the pipe from the steam box. Another part of the heated air and gases is taken by a pipe to this steam box.

[Printed, 10*d*. Drawings.]

A.D. 1853, January 14.—N° 100.

VRIES, JOHN HENRY.—(*Provisional protection only.*)—Motive power is obtained from gases evolved in the decomposition of water and other matters, in combination with compressed air, the whole being charged with electricity while in the generator. The water is combined with muriate of soda and nitrate of potass, by which the gases are evolved more rapidly, and is decomposed by electricity. Air is introduced by fans into the generator, and the gases are charged with electricity which may be derived from the earth or sea or atmospheric electricity. The gases work a rotatory engine which consists of a tube or trunk placed diametrically within a rotary annular chamber, through which tube the elastic fluid passes by nozzles into the chamber. The exhaust fluid escapes through hollow arms supporting the chamber. "A reci- "procating motion is communicated to the radical (radial ?) tube "which form valves at either end and regulates the admission of "the elastic fluid to the annular chamber. These valves change "at each semi-revolution so as to admit the gas alternately into "either half, the entire circumference being divided into two "compartments by diaphragms on which the valve faces work. "The one side of the rotary engine is thus alternately subjected "to the pressure of the fluid while the other is open to the "vacuum or to the air."

[Printed, 4*d*. No Drawing.]

A.D. 1853, January 26.—N° 194.

DAVIS, Theodore Dwight.—(*Provisional protection only.*)—Valve for steam and gas engines. This consists of a cylinder, within which is a second cylinder or valve, secured to a shaft which has a vibratory motion, given by an eccentric rod. This motion of the valve brings in communication alternately, openings in it with openings in the outer cylinder admitting the steam or gas, to the ends of the reciprocating cylinder. A hollow space or chamber in the valves connects alternately those openings in the outer cylinder with a central exhaust passage. For governing or regulating the engine the valve is worked by a lever communicating with the regulator.

[Printed, 6*d.* Drawing.]

A.D. 1853, January 31.—N° 258. (* *)

LAWRENCE, Frederick, DAVISON, William, and LAWRENCE, Alfred.—"Improvements in engines to be worked by "steam or other fluid."

The interior of the barrel or enclosing vessel is of the form known as epicycloidal or cardioidal, in which all cords are equal that pass through a certain point or focus. The piston or revolving disc is elliptical, and has the ends of its conjugate always in sliding contact with the concave epicycloidal surface of the barrel. The piston has "guide sides" to clasp the disc, which is fixed to the ends of the barrel at the focus, thus compelling the centre of the piston to pass through the focus in giving motion either to a crank in the interior, or directly to an axle in the centre of revolution. At certain positions of the piston, the pin fixed on the sides of the cylinder works in small slots in the piston, serving as a guide in those positions where the disc does not act to advantage, and to keep the ends of the piston in contact with the epicycloidal surface. The steam enters the epicycloidal space on one side of the revolving piston with a power proportioned to the difference between the portions on each side of the focus, giving motion by its revolution to the crank and main axle. The axle is propelled past its dead point by a balanced wheel, or by a piston working at right angles on the same shaft in another cylinder.

A method of driving a shaft at the focus without an internal *crank*, and the method of making tools for boring, and de-

scribing a true epicycloidal curve, with reference to diagrams, are described.

[Printed, 6*d*. Drawing.]

A.D. 1853, February 10.—N° 362.

ROGER, Robert.—(*Provisional protection only.*)—" Obtaining " motive power." The force produced by the explosion of any gas or body is caused to act against a piston or pistons, which are forced out and compress air into a receiver, whence it is used in lieu of steam to act against a piston, and thereby communicate motion.

[Printed, 4*d*. No Drawings.]

A.D. 1853, February 17.—N° 419.

KUFAHL, George Leopold Ludwig.—(*Provisional protection only.*)—" Application of atmospheric currents to obtaining " motive power." " The principle is that of the common wind- " mill, but with the exception of the yard arms and sails the con- " struction is very different." It consists of a vertical iron tube, steadied by braces or by an iron house over which is placed a second tube resting on a circular trough, provided with anti-friction rollers. The outside tube carries a shaft, lying horizontally or inclined a few degrees, and within the tube are mechanical contrivances required for transmitting the power obtained by the wind turning the sails. The whole, except the sails, is made of wrought iron, and constructed so as to be taken to pieces, and carried on the back of horses or mules.

[Printed, 4*d*. No Drawings.]

A.D. 1853, February 19.—N° 435.

ANDERSON, James.—" Obtaining motive power." Air, gases, or vapours are primarily condensed to a considerable extent while a jet of cold water or other suitable means is employed to cool the body being compressed. When the condensation has been completed, heat is applied to the compressed body so as to increase its elastic force. Such condensed and subsequently heated and elasticated body is intended to be worked in the ordinary manner or in any motive machine as a common steam engine.

[Printed, 4*d*. No Drawings.]

A.D. 1853, February 25.—N° 480. (* *)

NICHOLLS, HENRY MARTYN.—Emission or reaction engines.

Heretofore in these engines the steam or other elastic fluid has been allowed to flow continuously into the atmosphere or into a a vacuum; in this engine the steam or other elastic fluid from the boiler or source of supply enters a chamber, and when it has filled it the communication is cut off, and it is allowed to escape by its own elastic force merely. The main shaft is hollow, and the fluid passes from it into hollow arms, which have valves to regulate its emission and admission.

[Printed, 6*d*. Drawing.]

A.D. 1853, February 26.—N° 493.

TETLEY, CHARLES.—(*Letters Patent void for want of Final Specification.*)—This is for combining the use of water and heated air for obtaining power. A cylinder and piston reciprocating as in the common steam engine is preferred and is arranged so that as the piston is moving air heated by the furnace to as high a degree as may be flows into the cylinder, and heated water is at the same time injected and is converted into steam by the heat of the air.

[Printed, 4*d*. No Drawings.]

A.D. 1853, March 1.—N° 515.

BOLTON, ROBERT LEWIN.—Motive power is obtained from the explosion of gases introduced into a cylinder or suitable receptacle not as a motive power on their first introduction. The gases should be hydrogen and oxygen or atmospheric air. An expansive power is first produced which serves to drive a piston head and set machinery in motion. A second power is afterwards produced from the tendency to a vacuum in the explosion chamber. The explosion may be effected by spongy platinum, but better by sparks of electricity or galvinism. In this case one of the conducting wires should be in unbroken connection with the battery the other being an alternating conductor rising through the exploder and dipping by a curve into a vessel of mercury.

[Printed, 4*d*. No Drawings.]

A.D. 1853, March 2.—N° 516.

HILL, LAURENCE. — (*A communication.*) — "Motive power." The invention consists in moving engines by means of air heated and expanded by admixture therewith of steam or heated vapour. To do this one or more force pumps to compress the air and a strong air vessel to act as a receiver and reservoir for the air when compressed and a set of cocks or valves to admit the compressed air into the working cylinder require to be added to an engine similar to those presently driven by steam. The steam cylinder must be fitted with expansion valves to admit the steam from the boiler or generator for a portion of the stroke, and an additional set of valves attached to the working cylinder to admit the compressed air from the receiver into the cylinder must also be constructed and worked so as to admit the air for only a part of the stroke. The steam valve is then opened and steam admitted for another portion of the stroke and then also closed. The air being then admitted for a certain part of the stroke and the steam for another part the whole stroke is accomplished by the united effect produced by the expansion of the air, the expansion of the steam and also by the further expansion of the air to the heat imparted to it by the steam.

[Printed, 4*d*. No Drawings.]

A.D. 1853, March 3.—N° 532. (* *)

BARCLAY, ROBERT.—"Improvements in rotatory engines for "obtaining motive power, and for transmitting aeriform bodies "and fluids."

The engine "consists of an external fixed cylinder, set with its "axes horizontal, with the main driving shaft passing through "its centre. This cylinder or case contains a smaller hollow "piston, disc, or ring, set eccentrically to the main axis, and "well fitted to roll steam-tight round the interior of the outer "chamber, the actual line of contact between the two being kept "steam-tight as they work together by being pressed well into "contact by an internal wheel or roller. This roller is carried on "the pin of a short crank on the main shaft, the length of this "crank being regulated by the diameter of the internal roller, "and the thickness of the disc of the rolling piston, round the "inside of which the inner roller rolls. A parallel block of "metal, of the same width as the revolving ring or piston, is

" fitted to slide vertically between the two end covers of the fixed
" cylinder, and has an overhead stuffing box, to admit of free
" but steam-tight movements. The lower end of this piece of
" metal, which acts as a steam abutment, rests in a shallow
" groove, in a block fitting to the periphery of the rotating piston
" beneath. The steam or other actuating medium is supplied by
" a port on one side of the abutment into the eccentric annular
" space between the interior of the fixed outer case and the
" internal rolling disc piston; and the latter is thus compelled to
" roll round its outer cylinder, carrying with it its internal roller,
" which, being attached to the crank, thus communicates a
" rotatory motion to the main shaft." "When the main shaft
" is made to drive the rest of the parts, the engine becomes a
" pump or exhausting apparatus."

[Printed, 8*d*. Drawing.]

A.D. 1853, March 7.—N° 575. (* *)

CAROSIO, Augustino.—"A hydro-dynamic battery, or new or
" improved electro-magnetic apparatus, which, with its products,
" are applicable to the production of motive power, of light, and
" of heat."

This invention "consists in apparatus or machinery for decom-
" posing water or other suitable liquid by means of electricity,
" obtained from an electrical apparatus constructed on the prin-
" ciple of that known as 'Grove's gas battery,' or of a battery
" similar thereto, and in employing separately the gases so
" obtained for the production of motive power by their elastic
" force, and afterwards in recombining such gases in the gas
" battery to form the liquid from which such gases were origi-
" nally produced; and in which recombination a current of elec-
" tricity is generated for decomposing the water or other liquid
" employed."

In a "paper" in explanation of the Provisional Specification, the battery is called the "combinator;" the cells for the decomposition of water, the "regenerator;" and a "multiplier is described, which receives the gases, regulates and equalizes their pressure, and transmit them to separate piston and cylinder engines to produce motive power.

A "lucifer combinator" or battery is described, in which an *electric current is obtained* from the combustion of the gases.

"In order to supply any deficiency in the quantity of gas," "a magneto-electrical machine, driven by the engines, may be "applied to decompose water," "and thus obtain a supply of the "required gases."

[Printed, 1s. 2d. No Drawings.]

A.D. 1853, March 21.—N° 692.

POOLE, Moses.—(*A communication.*)—"Improvements in ob-"taining power when air is employed."

These consist first, "in absorbing the heat given out when the "air is compressed" by a jet of cold water.

Secondly, in "supplying the heat which is absorbed when the "air is expanded" by a jet of fused metal or other hot liquid, or by wire cloth heated by immersion in a bath of fused metal during the whole time of the exit of the air from the working cylinder, the wire being raised so as to be in the course of the air during its passage into the working cylinder, or by stationary wires heated by a current of hot air from the furnace, such blast being cut off during the entrance of air into the cylinder. Other ways of heating the air are described.

Thirdly, in "close air engines" in cooling the air which having been expanded in the working cylinder is returned to the force pumps by means similar to those used for heating.

Fourthly, in the form of the metal used for communicating or absorbing heat which is in strips, or tapes, or ribbons of metal with sharp edges, placed in a series of wires, the sharp edges presented to the current, and so that the edges of the tapes of each row shall be opposite the intervals of the edges of the adjoining row.

[Printed, 8d. Drawing.]

A.D. 1853, March 28.—N° 735.

BROWN, David Stephens.—Improvements in engines to be worked by steam or other elastic fluid.

These consist, first, in confining the steam or fluid in air-tight flexible or elastic bags or tubes. When used with a cylinder two bags (which may be made of vulcanized india-rubber or cloth impregnated with ordinary india-rubber if the heat be not too great) are placed one on each side of a piston which need not fit air-tight in the cylinder, and may be made of wood and of any shape. The steam or elastic fluid is admitted alternately into the bags by two

pipes joined to a plane surface which has placed on it (fitting air-tight) a bottomless box, to which a reciprocating motion is given and which is in three compartments, the central one communicating with the generating apparatus, and the outer ones receiving the waste steam and allowing it to escape. The bag may be used without a cylinder to give motion to a crank by means of a strap or rope. In such case it must be strengthened by netting similar to that which covers a balloon, or by a stronger bag. The bag may be made cylindrical, having at its two ends disks of wood or metal, one fixed to a frame, or the bag may be placed outside two cylinders and fastened to the lower part of one of them, the other cylinder being made to slide into the first like the parts of a telescope. The steam may be condensed or absorbed by a condenser in the ordinary manner or by allowing it to flow in chambers that are surrounded by wet cloths or ice or that contain sulphuric acid, dry sand, scorched oatmeal, or other absorbsive substance, and if the boiler as well as the condenser and the absorbsive substances in it be freed from air by a pump, no pump will afterwards be required for the condenser; "and even the fire "which heats the boiler may be dispensed with if desired, for the "force of the vapour in the boiler will be greater than it is in the "condenser in which it would be cooled or absorbed as aforesaid; "and if the boiler were made black and placed in the sun the "effect would be still greater. Other liquids may be substituted "for water, such as alcohol, ether, liquid ammonia, liquid car-"bonic acid, &c." The next improvement is placing a bag in the boiler or generating apparatus for removing the salt and other solid bodies that accumulate there. The boiler has a chamber and valves, and is placed in an inclined position. The other improvements are using the steam expansively by means of a cylinder having chambers each containing steam of a different degree of pressure. Strengthening the boilers and cylinders by internal wires and an external fabric of woven wire. Placing wool or cotton in the boiler to promote the evaporation and reducing the velocity with which the steam escapes by interposing some liquid substance.

[Printed, 8*d*. Drawing.]

A.D. 1853, March 30.—N° 761.

LOMBARD, Louis Michel.—"My new motive power results "*from* the effect of equal weights acting one upon the other, and

" is obtained principally by means of one of the weights losing all " or a part of its force by dividing its action and causing it to " balance itself, in consequence of which it can be easily raised " by another opposite weight which possesses all its force."

The weights are attached to the extremities of separate levers connected by an elaborate system of levers with equal and others with unequal arms, rods, and cords passing over systems of moveable pulleys. The result of the raising of one of the weights is produced chiefly by the action of that weight dividing itself above and below a moveable bar. "To apply the system to an alternate " and continuous motion it is necessary to connect three equal " weights in such manner that two of them together shall cause " the third to oscillate continually with double their own velocity, " at the same time producing a surplus power which becomes " motive power." The apparatus consists of a row of three denticulated wheels, fitting on one side into three vertical notched pieces and on the other into three denticulated levers. The drawings to which reference is made also show six weights connected by levers, rods, and cords. In the place of the weights, tubes or pipes fitted with air-tight pistons and having the air removed from them by the pneumatic pump may be employed.

[Printed, 1s. Drawings.]

A.D. 1853, March 30.—N° 769.

FAULKNER, Lot.—Motive power. The weights to be raised or machinery to be moved, are attached to the ends of a double beam vibrating upon centres. Two transverse shafts are mounted at equal distances from the centre on the beam so as to be capable of revolving. They may both be placed on the same side near the centre. A weighted lever is keyed on each shaft, one on each side of the beam. The shafts revolve in opposite directions, so that when one weighted lever is over the beam the other is under it. One shaft regulates the motion of the beam by a crank, and levers and links. By causing the shafts to revolve the weights are brought to each side of the beam alternately, thus making each side alternately the heavier and causing the beam to vibrate.

[Printed, 4d. No Drawings.]

A.D. 1853, March 31.—N° 773.

HANSON, George, and CHADWICK, David.—"Improve- " ments in apparatus for measuring gas, water, and other fluids,

"which improvements are also applicable for obtaining motive "power."

These consist in employing a flexible tube or bag capable of being divided into inlet and outlet chambers by a surface travelling thereon. The surface consists of a roller which is made to revolve by the pressure of fluids entering the inlet chambers and causing the roller to discharge the fluid which has already entered from the other side or chamber. The roller is connected with a shaft whose revolutions may be measured or from which motive power may be taken. "If used for obtaining "motive power motion may be communicated in any ordinary "way."

[Printed, 6*d*. Drawing.]

A.D. 1853, April 4.—N° 793.

NEWTON, WILLIAM EDWARD.—(*A communication from Charles Louis Felix Franchot.*)—This consists of improvements on a previous invention for which the Letters Patent, No. 10427, Old Law, were granted. "Motive power is obtained by the alternate expan- "sion and contraction of a volume of air alternately heated by a "stove and cooled by means of refrigerating apparatus, the air so "acted upon being made to operate first on the under side of "the piston in one cylinder and then passed through a re- "frigerator and transferred to the upper side of the piston in "another cylinder. Any convenient number of cylinders and "pistons, say four or six, are combined in a series and made to "act together so as to impart rotary motion to a crank shaft, "The pistons of these cylinders are however connected to the "crank shaft in such a manner that the several pistons are all in "advance one of the other, that is, they act one after the other; "or in other words, when one piston is commencing to ascend, "the next to it has ascended one-quarter or one-third of a stroke, "the next one-half or two-thirds as the case may be, and the "last if there are only four, is near the end of the stroke. By "this means some one or more of the pistons is or are always "acting on a favorable part of the throw of the crank. Another "improvement consists in employing separate pistons and cylin- "ders for receiving the hot and cold air. The pistons of each "pair of cylinders are connected together by a piston rod." "The "air may either be heated in the hot air cylinders by means of a "hot jacket or otherwise, or it may be heated previously to

" allowing it to enter the cylinders. The cold air cylinders are " kept cool by a jacket filled with cold water and which is renewed " as it becomes heated by the air."

An engine with two pairs of hot and cold cylinders is described.

[Printed, 1s. Drawings.]

A.D. 1853, April 9.—Nº 855.

GOBLE, George Frederic.—Machinery to be actuated by water or air, consisting in an endless chain or band connecting three large cylindrical wheels or drums. For working windmills the endless bands should be furnished at regular intervals either with canvas stretched on suitable frameworks or with Venetian systems of broad strong lathes, moveable at any angle, as used for windmill sails; and the improved machinery placed in such a direction that the wind can act only up or down the hypothenuse of a right angled triangle made by the drums, the other parts being covered up.

[Printed, 8d. Drawings.]

A.D. 1853, April 21.—Nº 961.

DURAN, Juan.—Motive power is obtained from a wheel composed of an axletree, eight arms and three rings or circles joined to each other by posts. On the middle ring are twenty-four small wheels each carrying a weight. These wheels have fourteen long notches fitting into those of a catch fixed at the bottom of the large wheel, and sixteen short fitting into those of another catch fixed at the top of the large wheel. These catches move the small wheels in such a manner as to make all the weights on one side of the large wheel to become developed or unfolded, while those on the other side are shut up within the limits of the large wheel. Thus this wheel is kept excentric, and out of its equilibrium, and motion is produced and kept up. A similar mechanism may be placed in each of the compartments between the central and the outer rings.

[Printed, 6d. Drawing.]

A.D. 1853, May 20.—Nº 1248.

SCHOLLICK, Edward Jones. — Water is decomposed by electric currents into its component gases which then pass into a

cylinder and are exploded by currents from a second electric apparatus and thus give motion to a piston in the cylinder. The motion of the piston causes the connection of the two poles of the exploding battery; when the cylinder is about two-thirds full of gas the explosion of the gas drives the piston the remainder of the stroke, and this will be followed by vacuity at the time the valves open to admit the gas on the other side of the piston. The water resulting from the explosion is driven through a tube with a valve opening outwards back to the vessel where it is decomposed. A partition of wire gauze is used to prevent the gas exploding in the generating vessel.

[Printed, 4*d*. No Drawings.]

A.D. 1853, May 20.—N° 1251. (* *)

BELLFORD, Auguste Edouard Loradoux.—(*A communication.*)—Rotary engine to be driven by any vapour, gas, or fluid.

The enclosing cylinder is stationary; the inner cylinder or steam wheel is connected by four arms to a boss on the axle; the annular space left between the cylindric surfaces forms the channel into which the steam is admitted, and wherein the pistons or sliders revolve. In each of the four arms is a radial slot in which the "wings" or pistons are forced outwards or inwards by small pistons within them acted on by steam at such times as the sliders themselves are moved by it, and it ceases when the exhausting process commences in the slot at its inner end. The motive steam enters the annular interspace between a wing that extends across the space and a fixed projection from the face of the outer cylinder, which forms the stop or abutment (of which there are two) against which the steam expanding gives motion to the inner cylinder. The regulation of the stream of steam by valves and cocks, the methods of forming the steam-tight joints, and framing the engines are described minutely.

A boiler tube is described corrugated on the outside or made with a fine screw thread, or abrasion or indentation. "A tube "thus formed radiates heat with the same fire in the proportion of "23 to 33 in time, as compared with a plane flue of the same "weight and with the same heating surface." The "moving "joints are made of stiff metal rings adjustable by set screws "or their equivalents."

[Printed, 1*s*. Drawings.]

A.D. 1853, May 25.—N° 1281. (* *)

BAUER, WILLIAM.—(*Provisional protection only.*)—This invention consists in so forming a vessel or boat, which it is proposed to call an "hyponaut apparatus" that it will either float on the surface of the water, or it may be made to descend under the surface of water, and when in either of these situations it may, by machinery within and outside the boat, be propelled and guided in any required direction. For the purpose of propulsion a screw propeller may be used. "The motive power is so generated as "not to consume any atmospheric air. It consists of a mixture "of nitre, sulphur, charcoal, and ammonia, which, on being "ignited, produces a gas or vapor of the requisite tension to work "a piston similar to that of a steam engine."

[Printed, 4*d.* No Drawings.]

A.D. 1853, May 31.—N° 1336.

GOODLET, GEORGE.—"Improvements in engines to be worked "by steam, air, or air and water combined."

When the engine is worked by air or air and water combined, the supply vessel has air pumped into it to produce the required pressure on the piston. When water is used, the air is pumped into the upper part of the vessel to press on the water. Instead of the ordinary slide valves a valve is used in which the ends of the slide are cut so as to admit of a more constant entrance and exit of steam or motive fluid. The piston rod may be made to extend through the cylinder. The slide is worked by a forked lever acting on studs on the valve. The lever works in a slot in the slide valve rod and has its fulcrum fixed to the cylinder. A self-acting throttle valve is substituted for the ordinary governor. In locomotives such valves may be worked by the engine driver. The cylinder has atmospheric vacuum valves opening in vessels at each end, by which the atmospheric air is brought to act on the piston in conjunction with the impelling fluid at each stroke. The water on leaving the cylinder passes into a vessel whence it is forced back into the supply vessel by a force pump, worked by the piston rod at the reverse end of the cylinder from that at which the rod is connected to the crank.

[Printed, 4*d.* No Drawings.]

A.D. 1853, June 9.—N° 1408.

PONÇON, Antoine. — A hollow cylinder in which a metal piston moves tightly is fixed to the lower part of a metal reservoir filled with water. A driving cylinder formed of two parts fitting tightly on each other and furnished with two valves moves in the reservoir and is connected by Vaucanson chains to balances. The piston is connected by a double joint to one extremity of a balance. And a similar apparatus is placed at the opposite extremity. When one driving cylinder has reached its greatest height a valve opens and the air escaping from the lower part of the cylinder will re-enter into the upper part. At the same time the other driving cylinder will be elongated, and displacing thus a great quantity of water will produce the lowering of the first driving cylinder. In descending its terminal conical portion will rest on the corresponding conical space in the piston. This piston will fall by the action of the balance and by an arrangement of catches the lower part of the driving cylinder is made to follow the piston, and thus the cylinder will be extended, the air entering by a valve then opened. "It is the alternate motion of " ascent and descent produced by the difference of volume which " the two driving cylinders alternately occupy which causes the " balances to move and thus form a new motive power."

[Printed, 8*d*. Drawing.]

A.D. 1853, June 9.—N° 1416.

NAPIER, James Robert, and RANKINE, William John Macquorn.—"Developing mechanical power by the action of " heat on air."

The upper and lower ends of a working cylinder respectively communicate with air-tight receivers. The upper part of each of these consists of a number of tubes open at the bottom and closed at the top. The lower part consists of tubes open at the top and closed at the bottom. The upper tubes are kept cold by a stream of water and the lower heated by the flue of a furnace.

A plunger is to be made to fit the body of the receiver as closely as is consistent with the moving up and down. It is composed of several compartments, one or more of which extend through the plunger so as to form a passage for air. Metal rods are attached to the top of the plunger and fit the upper tubes *loosely*. *Below* the plunger is a heat screen which consists of a

circular plate of metal pierced with holes, and having a series of metal rods attached to its lower surface, which fit loosely the lower tubes. The plunger is moved up and down by rods worked by the engine. The heat screen is also attached by a rod to one end of a beam turning on a pivot, which by means of a suitable catch is moved up by the rod working the plunger until near the top of the stroke, when the fire screen is allowed to fall by its own weight. By the motion of the plunger and heat screen the air is driven from one set of tubes to another, and thus alternately heated and cooled, and the heated air expanding will transmit its pressure and motion to the air in the cylinder.

[Printed, 1*s*. Drawings.]

A.D. 1853, June 13.—N° 1436.

WEBB, JOSEPH.—(*Provisional protection only.*)—The weight of bodies is rendered available for the purpose of creating a power sufficient to put them in motion. In the propulsion of carriages on railways the weight of the bodies is made to bear upon the ends of plungers or hydraulic rams, in connection with which are air chambers or pumps with pistons. The air compressed by the weight of the bodies is used as the motive power.

[Printed, 4*d*. No Drawings.]

A.D. 1853, June 15.—N° 1445. (* *)

PARSEY, ARTHUR.—Rotary engine to be worked by steam, air, gas, or water.

A cylinder mounted in bearings in the end covers of an outer or stationary cylinder revolves within it. In its revolution a line on its surface parallel with its axis will always be in sliding contact with a line on the concave periphery of the outer cylinder and parallel with its axis, and form a sliding separation between the spaces on each side of the line of contact.

The revolving cylinder has the same length interiorly as the casing cylinder; four radial slots or grooves are cut in its periphery, into each of which a "slider or flyer" is placed that moves steam-tight in its groove. The paddles slide outward across the space between the two cylinders, or inward into the slots in the revolving cylinder, closing or opening the communication between the steam and the vacuum. To assist this movement of the flyers springs are placed at their inner ends within the slots. In revolving, the flyers will be wholly pressed into their slots when their

edges come in contact with the surface of the outer cylinder, but as they recede from the line of contact the springs placed at the back of the flyers will press them outwardly across the steam channel until they again divide the crescent-shaped space into which the steam is admitted. Two or any number of flyers may be placed on the revolving wheel.

[Printed, 8*d*. Drawings.]

A.D. 1853, June 24.—N° 1540.

JOHNSON, John Henry.—(*A communication from Messieurs Guichené and Burgalat.*)—(*Provisional protection only.*)—The machine consists of a revolving disc fitted with a series of levers working horizontally and graduated in length, the short ones being nearer the centre. They are connected by a series of rods which transmit the movement throughout the series. The force of helical springs is communicated through the series to four pulleys pressing against the internal surface of a fixed ring surrounding the disc. The pulleys are of unequal size, and the pressure of the smaller is the greater, and as they press against the ring it forms a continuous incline along which the pulleys tend to roll, carrying the disc with them. The power may also also be obtained from two cylinders having one end greatly contracted, and each end furnished with a piston in direct communication with the bearings of the pulleys. The cylinders or pipes are filled with liquid or compressed air, and the small piston pressed down by a screw.

[Printed, 4*d*. No Drawings.]

A.D. 1853, June 29.—N° 1569.

IMRAY, John.—This consists, first, in obtaining rotary motion from the pressure of fluids by making two or three segments revolve within a cylinder, and controlling their relative motions by pins, cranks, and other contrivances, so as to cause successively recurring variations in the leverage or virtual velocity, so that the fluid entering and leaving by suitable ports gives rotary motion to a shaft. Secondly, in causing certain fluids to exert pressure. The apparatus consists of a vessel like a boiler, and a furnace supplied with fuel by a hopper having its lower part cylindrical, and containing a hollow cylinder with an opening at one part of its circumference. Air is forced into the furnace, and the products of combustion pass by a passage on one side of the boiler

and heat the water supplied by the feed pipe, and after pass through valves and tubes into the boiler, and rising through the water in numerous small streams convert part of it into steam. A portion of the mixed products is used to work a rotary apparatus for supplying air and the feed pump of the boiler, and the remainder is used for driving an engine.

[Printed, 10*d*. Drawing.]

A.D. 1853, June 30.—N° 1577. (* *)

WEBB, Joseph.—(*Provisional protection only.*)—"Improvements " in obtaining and applying motive power."

"This invention consists in the use and application of gas" [common coal gas?] "in combination with electricity, for the " for the purpose of exploding said gas within the cylinder of a " steam engine, and thereby to create an elastic force or power."

"In applying this invention to a rotary engine," "the axis " of the piston is formed hollow, as also the main driving shaft." A pipe is placed within such hollow parts, "one end of which is " in connection with a reservoir of gas," air is also admitted by this means; the other end of the pipe "terminates in the middle " of each piston, in which an opening is formed for establishing " a communication between the inside of the cylinder and the " inside of the axis of the piston, in which there is also placed a " wire of" [or ?] "wires, which are in connection with a battery, " for the purpose of passing a spark along one or other of said " wires for exploding the gas when it arrives at the opening which " communicates with the inside of the cylinder;" certain mechanism alternately opens and closes one of such openings, to move the piston and to reverse the direction of such motion, Thus, by admitting and exploding the gas, a succession of impulses and rotary motion will be imparted to the pistons and parts in connection therewith.

"This invention applies also to reciprocating engines generally. " and all other machines hitherto worked by an elastic force."

[Printed, 4*d*. No Drawings.]

A.D. 1853, July 4.—N° 1596.

DE AMEZAGA, François Mathieu.—Motive power is obtained from gravity by the force of a falling body, which unlike all other powers increases with the motion of the body. The

engine consists of four parts. First, two equal parallel wheels in vertical planes united by a horizontal axis, and each composed two concentric crowns joined by cross pieces. The two wheels are furnished with three equal weights, the middle one being placed at the top of the vertical through the axis when the engine is to be started. Secondly, a cast metal lever, whose plane is vertical. It is fixed to the axis of the wheels and is symetrical with respect to it. Its arms have each a groove extending from a third of the length of the arm to its extremity. Thirdly, an arm similar in form to the lever but without the groove and fitted on an axis on the same level as that of the wheels. Its length is two-thirds of the lever. One arm carries a galet pebble or pin which in the several motions of the machine passes successively through all the points of the groove. The whole of the motion of the lever and arm forms a system of bicentric levers. Fourthly, a steam engine or other motion which starts the engine by moving the arm. After the engine has been started the weights move or act with such acceleration that it is necessary in order to regulate the motion to slacken the march of the auxiliary motion till its force becomes in proportion to that developed by the weights.

[Printed, 1*s*. Drawings.]

A.D. 1853, July 8.—N° 1630.

BRUNIER, Louis.—This invention consists of a cylindrical vessel having two rising pipes connected by a pipe at their upper ends. One of the rising pipes communicates by a pipe which can be closed by a cock with an air pump. The other by a similar pipe with the engine to be worked. Within the cylinder are several small vessels with valves opening outwards and conical pipes which rise out of the cylindrical vessel. A corresponding number of small cylindrical vessels are attached to and communicate by pipes furnished with cocks with the pipe connecting the rising pipes. At the bottom of each of the small cylindrical vessels is an opening above and rather larger than the mouth of the conical pipes. The apex of a cone attached to each small cylindrical vessel passes through but does not fill such opening and the mouth of the conical pipe beneath it. The whole apparatus is at first filled with compressed air by the pump and then the cock leading to the engine being opened the air from the connecting pipe passes into the small *cylindrical* vessels and rushes "against the curved surface of the

" cone. The centrifugal force of the air thus produced presses at " right angles to the surface of the cone and thus causes the air " to pass into the conical open end of the press at an increased " velocity to that at which it left the vessel; the compressed air " will consequently carry in air from the outer atmosphere, and " thus will be supplied the air which is constantly passing off to " work the engines."

[Printed, 8*d*. Drawing.]

A.D. 1853, July 11.—Nº 1648.

WREDE, FABIAN.—" Improvement in gas and air engines," which have generators or vessels in which the same mass of gas is moved backwards and forwards and alternately heated and cooled. These consist of a cylinder enclosed in another cylinder but with some space between their respective walls and ends. The outer cylinder is closed, and the top is cooled by water and the bottom heated by a furnace. The inner cylinder is also closed, except that the top and bottom are perforated by a number of small holes. A piston working in the inner cylinder moves the gas, which is heated and cooled alternately by passing between the two cylinders and through the holes at the ends of the inner cylinder. It is important that the ends of the two cylinders should have " as great surfaces of contact as possible " without hindering the free passage of the gas between them."

The most applicable kind of gas is that mixture of nitrogen and carbonic oxide which is obtained when air is led slowly over red hot charcoal. This is used to prevent the oxidisation of the heated parts of the engine. If the gas engine be employed as single acting the end of the cylinder not in communication with the generator should be united with a reservoir in which gas is pumped to the average pressure in the generator.

[Printed, 8*d*. Drawing.]

A.D. 1853, July 23.—Nº 1736.

HUNTLEY, WILLIAM.—Valve regulators for engines to be worked by steam, air, or fluids.

The regulators are circular bodies fixed on the main or other shaft and fitted with slide bearings working on guides or bars fixed on the same shaft. An eccentric also fitted on the shaft acts by the blocks or sides of its straps on two cross bars on

the opposite side of the regulator. A rod attached like an ordinary eccentric rod transmits the motion to the rectifying lever, which is a double lever having a circular groove whose radius is equal to the length of the valve rod. The valve rod is fitted with a block which slides in this groove and can be adjusted by hand or by the governor. The regulator has a handle by which it is adjusted. The exhaust ports may be closed so as to prevent the entrance of air or deleterious matter. To stop or hold the engine steam is admitted before the end of the stroke and the cylinder is thus charged to act in opposition to the piston.

[Printed, 8*d*. Drawing.]

A.D. 1853, August 11.—N° 1868.

DEWSNUP, Thomas.—Motive power is obtained from india-rubber or similar elastic substances by winding the same on separate rollers and stretching them so that power is obtained in unwinding them. By arranging the rollers so that one is wound up at a time the motion primarily acquired is kept up continuously. In the application as a propelling power a number of strands of vulcanised india-rubber or other elastic substance are fastened to two strong hooks fixed on a frame, and pass round guide pulleys, and are then attached to and wound on two separate drums. When the necessary length is wound on the drums a check is taken off and the drums turn and their motion is communicated by a series of pulleys to the shaft to which the drawing wheels are connected.

[Printed, 6*d*. Drawing.]

A.D. 1853, August 13.—N° 1895. (* *)

LIPSCOMBE, Frederick.—Evaporation.

The heat from the lighted fuel rises through a grating into a chamber over the furnace and heats the air therein; the smoke being prevented ascending by a wire netting spread upon the grating, escapes at a chimney, the opening of which is below the grating, but neither the chamber nor tubes act as flues. The heated air in this chamber comes in contact with tubes containing water or spirit, and by the transmission of heat vaporizes the whole or greatest part of the spirit in contact with them. The vapour when the tubes are porous is generated on the external *surfaces of the tubes,* thereby cooling the liquid; when not porous

the vapour may be conducted from the tubes and either condensed or used to give motion to an engine.

To refrigerate a liquid a moderate heat from oil or other fuel only is required. All the vessels in contact with the fluid should be formed of porous material; the liquid causes this to become moist throughout its substance; the moderate warmth from the fuel produces a gentle evaporation from the moist surface; the liquid becomes cool, and the vapour escapes from the chamber.

Various modifications of the apparatus and its applications are described.

[Printed, 8*d*. Drawing.]

A.D. 1853, September 2.—N° 2032. (* *)

CAROSIO, Augustino.—"Improvements in obtaining power "by the aid of an electric current for motive and telegraphic "purposes."

The electric current is obtained from a "Grove's gas battery," and is applied to the decomposition of water; "the gases pro- "duced from such decomposition are turned to account to supply "the gases which are recombined in the battery," as described in the Specification N° 575, A.D. 1853. The electric current obtained from this apparatus sets in motion any suitable magnetic apparatus, thus giving a power applicable to motive and telegraphic purposes.

If a "De la Rive's condenser" is used, induction currents are produced, "which may be employed in place of galvanic battery "currents for telegraphic or other purposes, or they may be united "with the direct current for the decomposition of water;" "the "conducting wires constituting the coils" should be stout and short.

[Printed, 4*d*. No Drawings.]

A.D. 1853, September 3.—N° 2037. (* *)

WALKER, Thomas.—"Rotary engines to be worked by steam "or other fluids."

The rotating piston is fixed eccentrically on the main axle, and revolves within a fixed cylinder. The sliding stop or steam abutment, is in width equal to twice the distance from the centre of the piston to the centre of the case to which it revolves, and is protruded from a channel in the outer cylinder across the piston

chamber into sliding contact with the convex surface of the eccentric piston, and this contact is maintained by "steam or "fluid pressure." The inlet and outlet passages open into the channel, in which the abutment valve slides, and grooves are hollowed out at its sides for the passage of the steam into or out of the cylinder or case, and in passing into the engine it is controlled to act on one or other side by a reversing slide valve.

The engine is sometimes formed with two or more chambers on the same axle, and its case is cast in two pieces to facilitate the fitting of the parts.

[Printed, 1*s*. Drawings.]

A.D. 1853, September 6.—N° 2052.

DAVIS, James, and RAMSAY, Robert.—Engine to be worked by steam, air, or water, in which a vibrating motion is given to the driving shaft, by causing the motive agent to act on radial arms on wedge-shaped pieces attached to the shaft. The cylinder has an equal number of steam stops projecting radially, the inner edges of which fit steam-tight against the shaft. The steam passes into the valve between the face and back plates, which are connected and serve as a steam chest. They are kept apart solely by the difference of pressure of the steam between the plates and the steam pressing on the back of the valves, such difference being that of the pressures on the areas of the out and inside measurements of the steam pipe.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1853, September 12.—N° 2112.

CANNON, Charles.—Motive power to supersede steam atmospheric influence or electricity is obtained from two fly-wheels so equipoised that the slightest impetus will set them in motion, and constructed so that one-half of the wheel or crescent shall gradually increase in weight, while the other half shall be lighter, so that when one wheel bears the weight at the top, its opposite fellow will have it underneath; consequently one falls as the other rises, and a continual motion may be kept up by a very slight impetus on the shafts. These wheels are made to propel a carriage, in which case a seat is provided for the person who is to actuate the machine by means of levers or treadles.

[Printed, 6*d*. Drawing.]

A.D. 1853, September 19.—N° 2173.

STEPHENS, John.—(*Provisional protection only.*)—" Improve-" ments in obtaining motive power by the aid of air, steam, and " other expansive gases."

" I obtain motive power from machinery or apparatus which " consists of a pipe or pipes in which are air-tight plungers con-" nected with rods, which cause strains or pressures on certain " other parts within the pipe or pipes, for which purposes another " pipe or pipes are connected with exhausting air-pumps or " forcing pumps, as may be required to exhaust the air within " the pipe or pipes, or fill them with compressed air, steam, or " other expansive gases. The motion caused by the strains or " pressures within the pipe or pipes can be applied in the usual " way."

[Printed, 4*d*. No Drawings.]

A.D. 1853, October 7.—N° 2298.

MATTHIAS, William James, and BAILEY, Thomas.—(*Provisional protection only.*)—" Two axles are geared together " by cog wheels, to one of these axles the power is applied, and " on the other an eccentric is fixed, which acts to move out a " series of slides, each of which has applied to it a projection " which enters between spokes of a star wheel on a third axle, " and causes the star wheel and axle to revolve; but, by reason " of the eccentric, these slides and projections act with an in-" creased power on the third axle, and consequently the power " applied to the first axle is given off with increased effect on " the third axle."

[Printed, 4*d*. No Drawings.]

A.D. 1853, October 22.—N° 2446.

GREENFIELD, Hume.—(*A communication.*)—(*Provisional protection only.*)—" Obtaining power by carbonic acid gas," which is liquified in a receiver or refrigerator, which it is preferred should consist of tubes, thence the gas is drawn by a force pump worked by the engines into a series of tubes contained in reservoirs filled with heated oil. The heated liquified gas then passes into one of two chambers fixed at the end of the

working cylinder, and filled with oil. The heated liquified gas presses on the oil, moves the piston of the working cylinder, and thereby drives the oil into chambers at the other end of the cylinder, which will cause the liquified gas previously therein to pass again into the refrigerator by the use of a suitable valve and pipe. The heated liquified gas is then cut off from the first chamber, and driven into the chamber at the other end of the cylinder.

[Printed, 4*d*. No Drawings.]

A.D. 1853, October 31.—N° 2509.

BANNER, Edward Gregson.—Motive power is obtained, according to the first part of the Specification, from an axle working freely on bearings, and carrying a boss or plate, the circumference of which has at equal distances a number of weights or levers turning freely on their points of attachment, and each supplied with a spring so applied that when the lever is horizontal it will be kept so by the spring, and when the lever is inclined so that its weight or pressure on the spring is diminished, the spring will tend to raise it or to disturb the equilibrium of the system, and cause rotation round the axis. Another part consists in making the buckets of a water wheel curved, and keeping them full for nearly the entire height of the wheel by a wall or casing. Another part consists in increasing the weight of the fly wheel, or wheels of all arrangements rotating on an axle, after the machinery has been set in motion for the purpose of obtaining increased momentum.

[Printed, 8*d*. Drawing.]

A.D. 1853, November 26.—N° 2764. (* *)

ROUSSELOT, Joseph Scipion.—" An improved application " of magneto-electricity for driving machinery and for neutralizing " the impulsive force of machinery in motion."

In applying magneto-electricity to driving machinery, heated atmospheric air is employed (by preference) as a medium for giving motion to an engine. The air is heated by the combustion of the mixed gases produced from the decomposition of water by the electric current.

When this invention is applied to drive a locomotive engine, a " Grove's or other suitable battery " is employed, at starting, to

generate the gas; and when, by the combustion of the gas, a sufficient motive power is obtained, a magneto-electric apparatus is brought into connection with the water to be decomposed, and the decomposition continued by that means. The magneto-electric apparatus consists of a series of horse-shoe magnets fixed to the framing of the engine in such a position that they will act in connection with coiled soft iron armatures mounted on the axles of the running wheels. An electro-magnetic engine, consisting of helices into which cores are alternately attracted, is employed to force the air into an air chamber, from which the heating chamber and engine cylinders are supplied with air. Previous to entering the engine cylinders the air is further expanded in the valve box "by an electric spark being produced in the presence of the "heated air."

To arrest "the progress of a train by the aid of electro-mag-"netism," the electro current, generated as above, is diverted from the decomposing apparatus, &c., to electro-magnets mounted radially on the brake wheels, and having their effective poles in the circumferences of the wheels in contact with the rails. The clinging tendency of the wheels to the rails stops the train.

[Printed, 8*d*. Drawing.]

A.D. 1853, November 28.—N° 2768. (* *)

SOCHET, PRIX CHARLES JEAN BAPTISTE.—The improvement consists in the construction of apparatus for the dilatation of gases at high and low temperatures, and in their application to produce an economical motive power. 1. Overheated steam is generated in straight or spiral metallic tubes, into which a small stream of water is injected, or it is produced in a high-pressure boiler. 2. To obtain "compressed heated air" a close fire-box is supplied with air by a blowing apparatus, or a current of air is forced in by a jet of steam or gas. 3. The hot gases escaping from the aperture in the fire-box are conducted into reaction engines, and produce at their escape into the atmosphere a rotary motion. 4. Or are led "into an apparatus of simple construction, "which would consist of two chambers, in which the water "entering through valves in its bottom would be ejected through "a pipe by the intermittent action of heat and gases."

2. In a second class of engines "so high a temperature is not "employed, but its degree is caused to vary very rapidly within

" the two given limits." Atmospheric air is used " or a mixture " of air and water, steam, or vapours of volatile liquids, such as " ether or chloroform;" if a pressure higher than that of the atmosphere is required air may be supplied by a force pump, and heated by a furnace externally or in separate straight or spiral metallic tubes, into which round iron bars have been introduced to obtain a larger heating surface; " or the air is heated by injecting over heated steam into it, and this is the most certain and expeditious method.

3. For cooling the gases pipes containing cold water are set in the middle of the hot gases; or the hot gases circulate through pipes surrounded by cold water, or by the injection of cold water. " To produce a more rapid dilatation of the gases wire cloth or " other good conductor of heat, finely divided and capable of " instantaneously absorbing the caloric of the heated gases when " flowing in a certain direction, and directly giving it up to cold " gases flowing in the opposite direction, a cylinder with a solid " piston is used, which communicates at its extremities with a " chamber provided with sheets of 'superposed' metallic wire " cloth, or a cylinder with a long hollow piston provided inter- " nally with wire cloth, through which the gases are made to " circulate. 'It is evident in both these contrivances that if the " 'air is constantly heated at one end of the piston and cooled at " 'the other end the metallic cloth will also be heated at one end " 'and cooled at the other, which will give rise to an alternate " 'motion of the motive piston.' The regulating heated gas " piston does not require steam-tight packings, it merely serves " to set the gases in motion."

" To utilize the alternate pressure and depressure of the gases" they are caused to actuate a fixed alternate reaction apparatus, or to impel the piston of a single or double-acting gas expansion engine.

[Printed, 10*d*. Drawings.]

A.D. 1853, December 8.—N° 2850.

GODDARD, Joseph, and YATES, Charles.—(*Provisional protection only.*)—Motive power is obtained by a current of air or gas which is directed towards or about the space heated by a furnace through a coiled tube having a bell-shaped orifice, so as *to impinge upon* a series of blades or fans placed obliquely " on

" the periphery of a wheel or drum revolving within a con-
" centric air-tight case furnished with passages through which
" the current of air may enter and escape after giving motion to
" the wheel through the intervention of the blades."

[Printed, 6d. Drawing.]

A.D. 1853, December 12.—N° 2887. (* *)

EVANS, WILLIAM.—(*Provisional protection only.*)—" Obtaining and applying motive power." Constructs the pistons of " engines with distinct and separate hollow conical-shaped " chambers opposite to each other, and to which pipes are con- " nected for the admission of steam, air, or other aeriform fluid. " The piston is fitted to a frame which slides in a cylinder, in " which a vacuum is always maintained, the ends of the cylin- " ders being closed for that purpose; and the pipes which are " attached to the chambers of the piston work air-tight through " stuffing boxes in the cylinder's ends." Rods are attached to the framing of the piston and work air-tight in stuffing boxes at one of the ends of the cylinder, their outer ends being connected to cranks for the transmission of the motion produced by admitting steam or other fluid into one of the chambers of the piston, the other chamber being shut off during that time by a stop-cock, to be re-opened when the acting piston reaches the limit of its movement. " This invention applies to rotary as " well as reciprocating engines."

[Printed, 4d. No Drawings.]

A.D. 1853, December 31.—N° 3042.

HUNT, BENJAMIN.—(*Provisional protection only.*)—The invention relates to a new method of propelling by a column of fluid issuing by gravity alone from a lateral opening, and in a nearly horizontal direction, whereby a certain amount of reactionary force is given out in the opposite direction. But by the time the fluid has reached the floor or reservoir prepared for its reception its direction will be vertical or nearly so, and a very slight retarding effect will be produced. The fluid is again pumped up so that the head pressure remains the same. It is proposed to employ a portion of the power derived from the falling column to assist in raising the fluid again. It is also proposed to use solid

bodies in place of fluids for obtaining the necessary reactionary force.

[Printed, 4d. No Drawings.]

1854.

A.D. 1854, January 5.—N° 24.

JOHNSON, John Henry. — (*A communication from John Chilcott and George T. Palmer.*)—This consists in ventilating carriages by water trickling over webs, and forced up by a pump actuated by a wind wheel carried on a vertical shaft and fitted with a series of straight pallets which form the buckets or air chambers and which are wholly enclosed except at the periphery where the wind has access to them, and is directed upon them so as always to make the wheel turn in the same direction, whatever be that of the wind, by a series of moveable guides or conductors jointed so as to curve when swinging in one direction and to straighten when swinging in the other. Regulating valves moved by governor balls determine the volume of wind allowed to enter. These wind wheels may be used in any building or structure and for any purpose where power is required.

[Printed, 1s. Drawing.]

A.D. 1854, January 11.—N° 73. (* *)

PONÇON, Antoine.—(*Provisional protection only.*)—" Obtain-" ing a motive power."

" My invention consists in using the sun's rays to create a " vacuum in a suitable vessel, elevated at the height of a column " of water, which in the above vacuum is kept in equilibrium by " the pressure of the atmosphere. Such vacuum being formed, " I fill it with water acted upon by the external pressure of the " atmosphere, and thus obtain a head of water which may be " applied as motive power."

[Printed, 4d. No Drawings.]

A.D. 1854, January 13.—N° 88.

PARSEY, Arthur.—The improvements indicated consist, first, *of a double acting* air pump with a hollow piston and piston rod

through which air is admitted either above or below the piston. The cylinder may have a valve as large as itself. The piston rod passes through the valve and a spiral spring is coiled around it to keep the valve seated and separated from the cover. A series of cylinders with similar valves and fittings may be graduated to obtain compressed air at a high density. Secondly, of an ærometer or moveable reservoir for storing air or water. It consists of a cylinder which is raised by the air or other fluid and on obtaining its elevation the inlet pipe is closed and its weight causes it to descend over a block or piston and force its contents through the conducting pipe. The inlet pipe may be provided with a valve consisting of a small cylinder over a block "slightly doomed" with a deep cup of leather or flexible material nearly filled with water, oil, or other liquid. Pumps worked by the momentum of a locomotive engine or train when stopping or descending an inclined plane may be used to save power by pumping air into a reservoir. And the working cylinder may be heated by a coil of pipes of hot air or other fluid.

[Printed, 1*s.* 2*d.* Drawings.]

A.D. 1854, January 16.—N° 96. (* *)

STANSBURY, Charles Frederick.—(*A communication from Bernard Hughes.*)—By this mode, the bisulphuret of carbon, in the form of vapor, is used as a motive power.

A boiler of an ordinary steam engine is filled with the fluid and heat is applied to it, and fresh material is supplied by a pump as fast as it evaporates from the boiler, or the boiler is partly filled with water and the bi-sulphuret is injected into the water, heated to any temperature above 108°, or the bi-sulphuret is injected into the vapour of the water. To prevent the effects that would be produced by the bi-sulphuret acting chemically on the surfaces of various substances that might be used to form the boiler, this vessel and several of its appendages are best formed of brass which is not liable to corrosion. Water packing is used where leakage may occur.

The advantages of this substitute for steam are, that it boils at a temperature of 108°, water at 212°, and at that temperature the expansive power of the bi-sulphuret of carbon is double that of the water. When water passes into a state of vapour, 1000° of heat become latent in the vapour. When this bi-sulphuret passes into a state of vapour, *only* 144° become latent, the "saving of heat

"being as the difference between the quantity of heat latent in "the vapour of water, and latent in the vapour of the bi-sulphuret "of carbon." "In a condensing engine one-third of the power "is expended in pumping water for the condensation of the "steam."

[Printed, 4*d*. No Drawings.]

A.D. 1854, January 24.—N° 174.

SLEIGH, Adderley Willcocks.—"Self-acting self-sustaining "new motive power."

A semicircular cylinder or hemisphere is placed with its flat surface vertical, and in the centre of the circle of which the hemisphere forms half is an axle from which spokes extend to a wheel passing through a groove in the inner margin or concave side of the cylinder or hemisphere and forming an endless revolving slit valve wheel. Hollow cases, each divided into air and water compartments, are attached at numerous points to the wheel. The cylinder or hemisphere is filled with water or other fluid, and the weight of the cases outside the hemisphere or cylinder, aided by the buoyancy of the air compartment within, drives round the wheel. The summit of the hemisphere has a stuffing box or slide valve. The lowest part has a hydrostatic valve, from the orifice of which a small tube ascends to the top of the hemisphere. This valve has a number of plates entering on the two sides of a chamber, with a slight oblique tendency. A piston with a conical head perforated by a valvular duct closing on pressure from below and communicating with the summit of the hemisphere, works in the chamber. The plates are made to close by means of springs, and thereby accomplish the atomic displacement of the fluid, keeping the film of fluid up to, and pressing on, the piston which yields to it. The hydrostatic tube rises to any convenient height from the aperture in the spoke, and by the closing of the valves as the piston proceeds in its rotatory course, the hydrostatic pressure is conveyed through the tube to the film of water behind and underneath the inside valve plate. By these means an intermitting additional power is created which may be rendered uniform by two hydrostatic valvular chambers. A modification of the hydrostatic valves may also be used as a prime moving power.

[Printed, 1s. Drawings.]

A.D. 1854, January 25.—N° 191.

ANDERSON, James.—(*Provisional protection only.*)—"This "invention consists in bringing air gases or vapours at comparatively low temperature in contact with volatile matters at higher "temperatures, which matters have been condensed" upon any "cellular, permeable, or porous surface, the area of such surface being very considerable, so as to facilitate the rising of the "volatile vapours and their diffusion" and using "the force thus "acquired by the air or gases and the vapours of the volatile "matters for the production of motive power," "and in causing "the air, gases, and vapours after they have been thus worked to "return through the same cellular or porous mass again, imparting most of their heat to such mass for a repetition of the "action." The air and gases are heated partly by the heated volatile matter and partly by a furnace which warms a heating cylinder, where the gases expand, giving out their mechanical pressure or effect to the working piston in such cylinder.

[Printed, 4d. No Drawings.]

A.D. 1854, February 24.—N° 457.

BELLFORD, Auguste Edouard Loradoux.—(*A communication.*)—"Engines for generating power by means of the expansive force derived from heated air and gases by means of the "expansive force of liquid carbonic acid and other expansive "liquids."

These engines have generating cylinders connected one with each end of a working cylinder, as in Stirling's engines. The generating cylinders consist of three cylinders, the space between the outer and middle being filled with water to prevent leakage of the air or carbonic acid under a high pressure. The working cylinder communicates directly by a passage whose area is as large as that of the working cylinder with the generating cylinders. The working cylinder is filled with cold water to prevent the friction generated by the hot air. The air or other driving fluid is forced by a plunger from the lower part of the inner cylinder, where it is kept cold by water through a series of tubes placed in the space between the inner and middle cylinders, thence through a great number of glass rods and tubes from the size of a hair upwards, and a second series of tubes to the upper part of the generating cylinder. The lower

tubes are cooled by cold water circulating tubes, and the upper tubes and upper part of the generating cylinders heated by hot water circulating tubes. By reason of the top of the generating cylinder being the part heated and of the glass tubes, the difference between the hot and cold parts is better preserved than in other engines. The plunger is moved up and down by means of a cam and cam frame of such a form that the plunger will be brought down about two-thirds of its stroke in the "shortest " practicable time, when it will move slowly, so that the hot " air chamber shall be enlarged only as fast as the working " piston recedes from it and the air shall not expand down the " cooler."

[Printed, 1*s*. Drawing.]

A.D. 1854, March 8.—N° 549.

EDINGTON, James Charles.—(*Provisional protection only.*) —A cylinder fitted with a piston is charged with a mixture of carburetted hydrogen and air. A light is applied by a valve at the bottom, and the piston will be raised by the expansive power of the mixture, and after opening a valve at the bottom will descend. For guns a chamber is made for the mixture. Machinery may be thus worked, vessels propelled, and guns fired.

[Printed, 4*d*. No Drawings.]

A.D. 1854, March 8.—N° 557.

AITKEN, John. — (*Provisional protection only.*) — Obtaining power by lifting and lowering weights by two pulleys between which are guides for the weights used. "The lowest pulley is so " formed as to push the weights in succession up the guides to " the upper pulley over which it passes and descends by the " guide on the opposite side. The machine is set in motion " by any external power." "The weight of the balls falling and " their momentum is on one side of the working wheel, the " cog wheel, and on the other side the weight of the ascending " balls lessened by their momentum; the momentum in both " being in proportion to their velocity and the difference between " the two is the working power."

[Printed, 4*d*. No Drawings.]

A.D. 1854, April 1.—N° 745.

THOMAS, FREDERICK SAMSON.—Atmospheric air is made available for propelling carriages on railways by collecting it by a series of fans or blowing machines attached to and worked by the wheels of the carriages and transmitting it through flexible tubes into reservoirs contained in the atmospheric tender. From the tender the air passes to bellows worked by motive wheels, assisted by a rotating oscillating disc having mercury or a weighted ball placed in a hollow chamber. The disc gives an oscillating movement to the top part of the bellows and causes the depression of one of the bellows, and consequently the elevation of the other. The motive wheels are a set of metallic chambers in which are set balls, rollers, or any weighty fluid. The form of the chamber is such that the balls receive a centrifugal impulse on one side of the wheel and a centrifugal impulse or inclination on the other side, which movement is assisted by a spring or guide. The air is forced by the bellows into a heated chamber whence the heated and compressed air is conveyed into a cylinder to act on the cross head of a piston and thence passes into the atmosphere.

[Printed, 2*s*. 2*d*. Drawings.]

A.D. 1854, April 6.—N° 799.

NEWTON, ALFRED VINCENT.—(*A communication.*)—Improvements in hot air engines.

These are, first, cooling the piston in a working cylinder by a constant stream of cold water which is made to circulate through its interior, 2ndly, an auxiliary heater. The hot exhaust air after working the piston is used to supply the furnace which surrounds the main heater and thence passes with the smoke and gases from the furnace through a chimney and a series of flues which surround a series of chambers communicating by tubes furnished with valves. The air required for the engine is pumped into the first and proceeds through the other chambers and through a tube with a valve at the end, surrounded by the chimney of the furnace into the main heater whence it is supplied to " the hot air box " and the working cylinder.

[Printed, 10*d*. Drawing.]

A.D. 1854, April 22.—N° 930.

GOODCHAP, William.—(*A communication from Hume Greenfield.*)—(*Provisional protection only.*)—" Obtaining power by car-" bonic acid gas." The invention is the same as that described in No. 2446, A.D. 1853.

The liquified gas is obtained in a series of tubes called the refrigerator, and forced into a series of tubes contained in a series of reservoirs filled with heated oil, by which the liquified gas becomes heated and expanded, and from these passes into one or other of two chambers fixed at the ends of the working cylinder, and these are each equal in capacity to the working cylinder and are filled with oil. The heated liquified gas will press on the oil and move the piston to the other end of the cylinder and drive the oil into the chamber at the other end of the cylinder which will cause the liquified gas previously therein to pass again into the refrigerator by the use of a suitable valve and pipe.

[Printed, 4*d*. No Drawings.]

A.D. 1854, May 6.—N° 1019.

WALLER, Richard.—Motive power is obtained from liquids, vapours, gases, or air. The use of carbonic acid as the cheapest and most condensible gas is preferred. It is used in a fluid state and at first received into a strong vessel or reservoir from which it passes to one or more generators, where it is heated by hot water, steam, the residuum of the gas, or heated mercury. The gas then passes to the working cylinder and thence to another vessel called the expander, to which heat is also applied, and afterwards to a series of condensers into which it falls in a fluid state by being brought in contact with a lower temperature by pumps which force the condensing medium through jets, or by other suitable means. The gas then enters a rectifier where the condensing medium is separated from the gas by its greater weight, and is lastly conveyed back to the receiver or generator. For condensation fluid gas, the residuum formed from producing the gas, water, mercury, or any suitable matter is used. The vessels, except the condensers, are kept at the same temperature by hot-water jackets supplied from a boiler constructed with vertical inverted cones or tubes, and furnished with taps and reversing apparatus. The motive power may be obtained by means of a flexible piston or diaphragm

placed within, and made the full size of two discs with projecting flanges similar in shape to a dinner plate. The condensing medium is refrigerated in a cold water tank and worked over and over again. In one arrangement vessels are used alternately as condensers and generators and the gas is reversed in the passages leading from one to the other, but not in the expander or the pipe leading to the engine. The inventor makes use of a special kind of valve for which he previously obtained Letters Patent (No. 983, A.D. 1854), and which is described as suitable for steam engines and other specified apparatus or "for any other " purposes where great pressure results from fluids or aeriform " bodies."

[Printed, 2s. Drawing.]

A.D. 1854, May 13.—N° 1072.

BARSANTI, Eugène, and MATTEUCCI, Felix.—(*Provisional protection only.*)—Applying the explosion of gases as a motive power.

Two cylinders are used, whose pistons move in opposite directions. Each cylinder has at its lower end two openings connected by an outer passage, one opening when the piston is at its lowest position communicates with the cylinder above the piston which is open to the atmosphere; the other with the cylinder below the piston. When one piston is pushed forward by the last stroke of the returning course of the other the quantity of air necessary for the change rushes in and the azote is discharged through the same passage when the piston reaches the bottom. The hydrogen enters in due proportion after the air by a third opening, and is exploded by an electric sparkle caused by the ascent of the piston. This thrusts forward the piston whose return is caused by the pressure of the atmosphere. When it arrives at the extremity of its returning course explosion takes place in the other cylinder. The force may be applied 1st, by the action of piston rods in the course of their return. 2ndly, by closing the upper parts of the cylinders by a lid provided with valves and a conducting tube so as to act as an air pump to supply condensed air to an engine. And, 3rdly, in navigation, by connecting a series of plates to the piston rods so disposed as to meet the resistance of water when the piston is ascending.

[Printed, 4d. No Drawings.]

A.D. 1854, May 13.—N° 1075. (* *)

BURLEIGH, RICHARD CLARKE.—Improvements in engines worked by gaseous pressure or by steam.

Instead of the ordinary cylinder of fixed dimensions, and containing a piston moving within it by the pressure of steam, a vessel is substitnted which has no piston or cylinder, but expands by the pressure of the steam, and collapses when that is shut off; the power is obtained by the movement of the vessel itself in which the steam is contained.

The vessel is formed of two discs of thin flexible copper hermetrically rivetted together round their entire margin, and have their surfaces corrugated so as to admit such a change of form by the flexure of the metal as will allow the discs to be separated bp internal pressure, and to return at its removal to their original size without distortion of form or unequal protrusion of any part of their surface. The engine being in operation, the steam is admitted through a valve into the space between the elastic discs, distends them; when the discs fill a certain space, the steam is shut off and the condenser valve opened, the discs collapse, the connecting rod on the exterior of the discs falls and moves a crank or shaft attached to it and the stroke is complete. The valves being reversed, the elastic discs are again distended by steam, which is again condensed, the rod falls, and a second stroke has been made, and so on.

2. Describes an engine with a double motion, and having a diaphragm placed between and separating the discs as a substitute for a sliding piston.

3. A method of accumulating the motions of a series of discs into one stroke.

4. Adapts the combination to act as a pump.

[Printed, 1s. 10d. Drawings.]

A.D. 1854, June 5.—N° 1251.

SPILLER, THOMAS.—(*Provisional protection only.*)—In order to propel carriages, air is collected by means of fans which give motion to an axis and thus to pump rods, each of the pumps communicating with a chamber with a trumpet mouth. The fans are set in motion by the movement of the carriage and the air is thereby forced into a receiver lined with a gutta percha or other *flexible bag.* The condensed air is then conducted by a pipe to

a heating apparatus, thence it passes to the engine to act on the piston or pistons and afterwards to the fire to aid the combustion.

[Printed, 4*d*. No Drawings.]

A.D. 1854, June 21.—N° 1360.

SHAW, JAMES WHITWORTH.—(*A communication from Don Manuel Maria José Trinidad Miciano y-Contillo.*)—(*Provisional protection only.*)—"The invention consists in a certain arrange-" ment and combination of an axle with a system of shifting " radial arms or levers furnished with weights, and maintaining " a motive power by the force of gravity alone without any other " agent than mechanism."

[Printed, 4*d*. No Drawings.]

A.D. 1854, July 4.—N° 1466.

BISHOPP, GEORGE DANIEL.—Engines to be driven by steam, air, gas, or water having two, four, or more cylinders fixed opposite or near one end of the main shaft, side by side, round a centre line coinciding with the centre line produced of the shaft. To each piston or rod is fitted by a hole and socket, or universal joint, the end of an arm whose other end is fixed to a central universal joint or link which is fitted to all such arms, and also to one end of a strong arm perpendicular to the arms fitting the piston rods, whose other end enters a hole on the crank in the engine shaft.

[Printed, 1*s*. Drawings.]

A.D. 1854, July 4.—N° 1470. (* *)

JOHNSON, JOHN HENRY.—(*A communication from Jacques Eugene Armengaud.*)—(*Provisional protection only.*)—Obtaining motive power by the application of an entirely new principle to the driving of machinery, or propulsion in general, based on the fact that "two bodies in juxtaposition, which are separated " by any elastic force and driven in two opposite directions, " will mutually form the fulcrum." If one of the two bodies be constantly replaced, or is caused "to return without any op-" posing force or neutralizing the movement of the other " body," so that "the juxtaposition of the two bodies may be " always re-established, and the elastic force tend constantly " to separate them, a constant fulcrum or bearing in one direc-

" tion will be obtained." To carry out this principle " a long " cylinder with a piston, which is acted upon by steam or " compressed air on one side, and acted against by a column " of fluid, which is also acted upon by compressed air con- " tained in a vessel in connection with the other end of the " cylinder." The motion is communicated to a crank.

[Printed, 4*d*. No Drawings.]

A.D. 1854, July 6.—Nº 1481.

ARROWSMITH, John.—(*Provisional protection only*.)—Consuming smoke and obtaining motive power therefrom.

The smoke and heated air is drawn from steam boiler and other furnaces by an exhausting force pump, and is made to pass through and over coke fires, mixed, if necessary, with more air. In large manufactories and buildings the smoke from the various furnaces is all collected into a large central tower or chimney, and in towns large towers or chimneys are made at suitable intervals. In these towers, not only no pump or fan is necessary, but the force of the ascending current of heated air may be used as a source of motive power for which purpose fans, vanes, or other suitable machines are introduced at any convenient point or points.

[Printed, 4*d*. No Drawings.]

A.D. 1854, July 15.—Nº 1562.

KELSEY, George Wade.—This consists in expanding the air in the chamber of air engines by means of a flame of gas inside the chamber. There are three gas pipes and three steam pipes placed by their side or beneath them. The form of gas-burner shown is an argand burner with a jet of steam passing up the centre. The tubes for the passage of gas are drilled in an inclined direction, so that the jets incline towards each other and to a point above the burner. Three burners are attached to each gas pipe. The chamber is furnished with a safety valve of which the lever must be lifted before the lighting hole can be opened.

[Printed, 6*d*. Drawing.]

A.D. 1854, July 26.—Nº 1641.

PURNELLE, John Chillcott.—The first part of the invention consists in a cylinder enclosing a piston similar in construction *to those* employed in steam engines, and worked by the com-

pressed air contained in "an air-chest which is connected by short "pipes with a pair of large cylinders, which I call condensers," open at the top and fitted with air-tight pistons. The air is first pumped into one of the condensers by manual power, and a heavy weight is then placed on its piston. The engine is made to work an air pump which fills the other condenser while the first is being discharged. "I then weight the piston of the "other condenser by which the weight will be taken off the first "condenser" which is then put into communication with the air pump.

The second part of the invention consists of air pumps for partially exhausting air alternately above and below the piston of a cylinder. The piston being then moved by the atmosphere. The air pumps may be worked by a small steam engine. This invention may be used for transmitting power from a steam engine in cases where it is necessary to have the fire at a considerable distance from the works.

[Printed, 10*d*. Drawing.]

A.D. 1854, August 7.—N° 1728. (* *)

KNIGHT, JOHN.—(*Provisional protection only.*)—"Improve-"ments in engines to be worked by steam, air, or other fluids "or liquids."

By a new arrangement of the parts, a more compact engine is produced. The cylinder together with its piston is mounted so that it may reciprocate to and fro. By causing them to move, and connecting them to the same shafts by cranks, a double motion is obtained, which is transmitted from the crank shaft with a much shorter stroke than usual. The engine may be mounted horizontally or vertically.

[Printed, 4*d*. No Drawings.]

A.D. 1854, August 9.—N° 1744.

OULTON, PLATO.—Motive power is obtained from two or more main wheels actuated by a stream of leaden or other balls which roll down an inclined plane, each ball entering a bucket on the wheels. The balls afterwards are deposited on and run down another short inclined plane, and are carried on to screws or worm shafts which are made to revolve by gearing from the main wheels and carry the balls up back to the first plane. These shafts may

be dispensed with by making the wheels with recesses which receive the balls from an inclined plane, and after carrying them round drop them in succession upon it. The wheels are in this case kept in motion by the combined action of the balls at the lower part of their periphery and of those at other points of the periphery beyond the dead centre before they drop from the wheels on to the inclined plane.

[Printed, 10*d*. Drawings.]

A.D. 1854, August 26.—N° 1875. (* *)

BROOMAN, Richard Archibald. — (*A communication.*) — " Improvements in obtaining motive power."

This invention relates to "obtaining motive power from the " force of gravity;" also to obtaining motive power "from the " combined forces of gravity and electro-magnetism."

In obtaining motive power by gravity, two wheels placed vertically side by side upon separate axes, "are made to act " alternately upon each other, so as to keep up a continuous " motion." For this purpose each wheel is "weighted for about " one-sixth of its circumference," the weighted part of one wheel, when in a vertical line with its centre, being opposite to the weighted part of the other. "When one wheel has performed " half of its revolution by gravity, a projecting arm takes into a " corresponding projection or other suitable mechanical con- " trivance in the other wheel, and is carried up by the descent of " the first, and so on, until the apparatus is stopped."

To regulate, quicken, or slacken the speed of the wheels, "a set " of semicircular" [a semicircular set of?] "electro-magnets" is placed over one or both of the wheels; these act either by attraction or repulsion, as may be required, and are excited in proper order by suitable "breaks and springs."

Instead of having a second wheel, the heavy part of one wheel may be raised through half a revolution by a semicircular set of electro-magnets, excited successively by suitable "breaks and " springs."

[Printed, 8*d*. Drawing.]

A.D. 1854, October 4.—N° 2128.

THOMAS, Frederick Samson.—(*Provisonal protection only.*) —"*An improved* locomotive whereby I collect, compress, and

"expand atmospheric air." "The mode by which I collect the "atmosphere is by bellows of the fan construction, which I affix "to and work by the axles of wheels of the carriages of the train; "such atmosphere I then convey into reservoirs and box bellows, "which I compress by the rotation thereupon of a laden disk "and subsequently expand by the application of caloric, in which "state I employ it."

[Printed, 4*d*. No Drawings.]

A.D. 1854, October 4.—Nº 2129.

THOMAS, FREDERICK SAMSON.—(*Provisional protection only.*) —Motive power is obtained from a wheel in which are formed arms or chambers. Weighty balls, rollers, or fluids are placed on or within these and approach the periphery of the wheel upon the descending side and the center or vane of the wheel on the ascending side. The power is provided by the greater leverage on the descending side.

[Printed, 4*d*. No Drawings.]

A.D. 1854, November 7.—Nº 2349.

WORTS, JAMES KING, sen., WORTS, JAMES, jun., and PAGE, ISAAC.—(*Provisional protection only.*)—It is proposed to use a weight, lever, or pendulum, which, being set in motion by hand or other power, will by its power of gravity (the movement being kept up by hand or other mechanical means) continue to swing. The upper part is attached to cranks or other portions of machinery which require a turning power, and is applicable to the propulsion of vessels, for mill or thrashing machinery and other purposes for which turning is usually required.

[Printed, 4*d*. No Drawings.]

A.D. 1854, November 11.—Nº 2398.

THOMSON, JAMES.—(*Provisional protection only.*)—Motive power is obtained by means of a long pipe fixed around an axis which is free to rotate. One end of the pipe opens into a vessel filled with compressed air. The other end is open to the outer atmosphere. By reason of the air not being allowed to escape at an early period it will be found that the air at the end of the pipe "will escape only slowly, whilst at the feed end, the pressure,

and consequently force will remain the same. And the rotation "of the axis will depend on that force as if it were an ordinary "Barker's mill."

[Printed, 4*d*. No Drawings.]

A.D. 1854, November 16.—N° 2432.

HANN, William.—This consists in propelling vessels by fixing uprights which may be hollow to contain vertical shafts, and which each carry a horizontal shaft, on the ends of which are arranged vanes made to revolve within a bell-mouthed cylinder carried by the upright, so that it can be moved to the wind. The horizontal shaft gives motion to the vertical shaft and it to the propeller shaft.

[Printed, 6*d*. Drawing.]

A.D. 1854, November 28.—N° 2504.

STAUNTON, Thomas.—(*A communication.*)—(*Provisional protection only.*)—Motive power is obtained by compressing air by means of several pistons and cylinders. The air passes into the cylinders successively. Each cylinder is of proportionably greater internal dimensions than the one into which the air next enters. A drawing is given of a locomotive as an illustration, in which the pistons are worked by a rod from the driving wheel.

[Printed, 6*d*. Drawing.]

A.D. 1854, December 9.—N° 2589.

HALE, George.—(*Provisional protection only.*)—Weights are applied to or connected with rotating jointed arms, and act on and drive a central shaft. The arms are so arranged that when intended to act on the shaft they will be extended outwards to their greatest extent, so that the weights act with the greatest leverage. When they have so acted, and are required to be brought up again to their elevated position, the weights are brought nearer to the centre of the shaft so as to diminish the leverage.

[Printed, 4*d*. No Drawings.]

A.D. 1854, December 30.—N° 2762.

JOHNSON, John Henry.—(*A communication from Jacques Eugene Armengaud.*)—Motive power based on the principle that

two bodies in juxta-position which are separated by any elastic force and driven in opposite directions will mutually form a fulcrum. If at the same time an arrangement is made either to replace constantly one of the two bodies or to cause it to return without any opposing effort so that the juxta-position of the bodies will be always re-established, and the elastic force tend constantly to separate them, a constant fulcrum or bearing in one direction will be obtained. The principle is proposed to be carried out by employing a long cylinder fitted with a piston acted on one side by an elastic force as steam, compressed air, or gas, and on the other by a column of fluid (mercury or other dense fluid), which fluid is also acted on by compressed air or other elastic power. A locomotive engine for common roads is described where steam is made to act on one side of the piston and drive it forward, and is during the back stroke driven into the reservoir containing the dense fluid.

[Printed, 10*d*. Drawing.]

1855.

A.D. 1855, January 1.—N° 3. (* *)

SEGUIN, JOSEPH.—" Obtaining motive power by the expansion " of air, steam, and other fluids."

When a vapour or gas has been expanded to produce motive power a loss of its heat takes place proportionate to the mechanical effort, besides an accidental loss from the vapour coming in contact with the surfaces of the vessels enclosing it. If a portion of heat equal to that rendered effete by its mechanical effort, be added to the elastic fluid it will be capable of a second and successive efforts. Two similar engines placed side by side, horizontally, have their two pistons connected to opposite cranks on the same shaft, and, therefore, act in opposite directions. Two generators corresponding to the two cylinders are set in a furnace divided into two parts each having a separate fire. Each generator contains water which is to be converted into superheated steam. One of the generators (the first) being put in communication with its cylinder, piston is driven forward by the expansion of the steam, the crank performing half a revolution; the two

cylinders acting in opposite directions, the second cylinder makes its stroke, and completes the revolution of the shaft; at the same time the piston of the first cylinder is driven back by its crank and forces the steam into the generator which supplied it. The second generator supplies steam for the next stroke, that of the preceding stroke remains confined in the generator, where it regains as much heat as it had lost in moving the piston; "thus "the generators alternately furnish steam during the successive "double strokes of the piston, and it is always the same steam "(without changing its state) after producing its effect that re-"enters into the generator, where it remains confined during a "complete revolution of the shaft, and becoming again heated "acts on the cylinder during the following revolution," and the engine acts by steam without the necessity of losing the latent heat which is consumed in other engines in converting the water into vapour.

The construction and operation of the valve gear, and some modifications in its arrangement are also described.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1855, January 5.—N° 30.

GIRARD, LOUIS DOMINIQUE.—Applying steam fluids and gases for obtaining motive power based on a new system of ejection of fluids.

The relative velocity of the fluid must not be altered by the pressure resulting from the resistance of the channel, but these conditions may be satisfied without using fixed or disecting vanes. The fluid is made to enter into the wheel or turbine by an orifice in the nave, and then acts on the vanes, for which purpose the vertical section of the passages is gradually enlarged from the inner to the outer parts. The fluid loses a portion of its velocity by expending part of its working power, and is ejected into an annular space without vanes, whence it goes to a second compartment with vanes on which it acts as in the first compartment. After a succession of such compartments in which the pressure progressively diminishes, the fluid is discharged into a condenser or into the atmosphere .Apparatuses for condensing, forcing, and rarefying liquids are described.

[Printed, 8*d*. Drawing.]

A.D. 1855, January 31.—N° 238.

MALAVAS, JACQUES ROUX DELGUEY.—Machinery for obtaining motive power composed of a series of several sets, the number of which must be always even. The principle parts in a set consist of an escapement balance mounted on the main shaft to which all the escapement balance levers are fixed spirally, a balance lever furnished with a detent at each extremity, a carrying beam mounted at its right extremity on an axis, while its left rests on a fixed point in a mortice or slot wherein it is free to move vertically at the centre of the balance from the left hand detent: at the point of gravitation or centre of the beam is suspended any suitable weight. Two transmission beams linked together, of which the right-hand beam has its right arm connected by a link to the small arm of the large balance lever, and the left-hand beam is provided at its left arm with a piece which moves vertically upon one of the surfaces of the carrying beam. And an elbow lever which facilitates the placing of the left-hand detent so as to allow it an easy passage to the right. The balance lever, transmission beams, and elbow levers have their gravitating points upon the carrying beam. The power of the machine depends on the difference which exists with the same weight according to whether it is brought nearer or further from its point of gravitation.

[Printed, 10*d*. Drawing.]

A.D. 1855, February 2.—N° 249.

SOELMAN, WILLIAM.—(*Complete Specification, but no Letters Patent.*)—Ship moving machine consisting of a propeller, also applicable as a wind mill or water wheel.

It consists of a disc of inclined planes attached to a horizontal shatf. The lateral edges of each plane must coincide or be in the same planes as the lateral edges of the adjoining planes. All the planes should have an inclination of forty-five degrees, and the number constituting a disc should be at least three, but eight is best. For wind mills the disc should be made to revolve within a cylinder longer and wider at the entrance and tapering inwards to create a draft. A wind mill of the same form as the propeller may be used in ships as an additional motive power.

[Printed, 8*d*. Drawing.]

A.D. 1855, February 7.—N° 285.

FONTAINEMOREAU, PETER ARMAND LE COMTE DE.—(*A communication.*)—" Applying as motive power heated air combined " with the vapor of ether, or of any other liquid easily vaporised."

The apparatus used consists of four cylinders with pistons, two large and two small. The small cylinders are opposite to the large cylinders, and have piston rods in common with them. The two rods are both attached to a cross bar working on guides, and moving the shaft by connecting rods and cranks. Each pair of cylinders is provided with air and ether slide valve boxes. The ether is vaporised in a hollow screw revolving on a hollow core by the hot air, which after it has expanded in the large cylinder passes between the partitions round the core, and thence into a chamber furnished with wire gauze, where it deposits its heat and then escapes. The ether is condensed in an apparatus " which can be " constructed on the same principle as that described for the " evaporation, substituting cold water for hot air." The air is forced into a reservoir and heated. " It then passes into the small " cylinders through the slide valves, then the ether which has been " brought in contact with the hot air of the boiler is vaporised and " passes into the ether vapour distributing box, where it finds the " slide valve in a position which permits it to pass under the small " pistons to recommence its course in an opposite direction, the " expanded air expelled from the opposite end of the cylinder " repasses by the sliding valve provided with a double bottom, " and enters a canal which opens a communication with the large " cylinder where it expands, thus doubling the power of the " machine. The ether expands also by the same means in the " large cylinder at the side opposite the piston rods, afterwards " passing to the condenser."

[Printed, 10*d*. Drawings.]

A.D. 1855, February 23.—N° 402.

ZAHN, WILLIAM HENRY.—(*A communication.*)—" Windmills."

The sails are attached to rotating spindles passing radially through the rim of a wheel, and into its hub, and by means of levers connected to a head which rotates with the horizontal shaft may be turned more or less obliquely to the wind. The horizontal shaft has a crank which works a pump and forces water from one tank at the base of the mill to another. In

general the water flows back into the first tank through a pipe, but if the horizontal shaft revolve too rapidly a cock is somewhat turned. The water is then forced against the under side of a piston in a cylinder and raises it. By a series of levers the motion is communicated to the head on the shaft which is pushed forward, and in consequence the spindles are turned and the sails moved obliquely to the wind. When it is desired to increase the motion of the mill the cock is opened, and the sails caused to return to their original position by means of a weight on one of the levers connecting the piston with the head on the shaft.

[Printed, 8*d.* Drawing.]

A.D. 1855, March 8.—N° 514. (* *)

WALKER, THOMAS.—" Rotary engines to be worked by steam " or other fluid."

The inner cylinder is mounted on the main shaft, which has conical bearings, and revolves within the stationary outer cylinder. The steam abutment is carried through a slot in the fixed cylinder, and, during the eccentric revolution of the inner cylinder, rises and falls in the slot to maintain contact with its periphery, and divide the vacuum from the steam space. The engine may be constructed in two compartments, and the two pistons framed on the common axle. The bearings have collars or linings of a " conical figure " to correspond with the conical parts of the shaft, and may be moved and turned round to present a fresh surface in case of wearing. The abutment valve is recessed on one of its surfaces to form a steam passage, and steam is introduced behind it, to keep its edge up to the surface of the inner cylinder. The outer cylinder is nearly surrounded with a casing or jacket, and the exhaust steam is introduced into the "interspace," and as it condenses, the water of condensation is collected in a well.

[Printed, 8*d.* Drawing.]

A.D. 1855, March 13.—N° 562.

NEWTON, ALFRED VINCENT.—(*A communication.*)—Improvements in engines worked by " explosive mixtures."

These are,—An apparatus for igniting the mixtures of gases in working cylinders, consisting of a thimble-shaped piece of hard cast iron or other suitable metal, which juts into openings in the cylinder, and is kept at a temperature sufficient to explode

the gases by a blow pipe communicating with the gas reservoir. There are two of these contrivances placed at the opposite ends of the cylinder, and alternately uncovered by the piston. 2ndly, a manner of keeping the cylinder and piston cool by cold water made to pass into a jacket surrounding the cylinder, thence through a fixed tube on which the piston slides into the piston and piston rod.

The gases are obtained in the proper proportion by having a pump both for the supply of the engine and the blow pipe, with proper valves opening respectively into a pipe conveying the gas to be exploded and the atmosphere.

[Printed, 10*d*. Drawing.]

A.D. 1855, March 17.—N° 600.

JOHNSON, John Henry. — (*A communication from Joseph Ghilliano and Henri Cristin.*)—"Carbonic acid gas is generated from the liquid acid and applied to generate motion.

The main feature is the generation of the gas by the aid of a water bath whereby a uniform heat and nearly uniform pressure is kept up. It takes place in a cast-iron vessel with curved top and flat bottom fitted with a number of tubes closed at the bottom, but open at the top and projecting a little into the interior of the vessel, and extending down into the hot water bath. The acid is forced into this vessel, and the water kept boiling. The gas is conducted alternately to one of two single-acting cylinders or to a double-acting cylinder, and after acting on the piston to a condenser consisting of a serpentine tube or worm completely immersed in a cold liquid, such apparatus being similar to that known in France as Thilorier's apparatus. The condensed acid is pumped back into the generator. The generator communicates with a vessel containing carbonate of soda, into which sulphuric acid may be made to flow. Certain ingredients may be added to the water, or some other liquid may be employed in order to obtain a uniform temperature higher or lower than that of boiling water.

[Printed, 10*d*. Drawing.]

A.D. 1855, March 28.—N° 692.

PEABODY, Joseph.—(*A communication from Francis Peabody.*) "Machinery for obtaining motive power by the action of the "wind."

The shaft which carries the wind wheel runs in boxes upon the top of an annular table, which by means of rollers is made to run over a similar fixed table placed below it, the two forming a complete turntable, down the centre of which a pump rod descends. The wind wheel is kept in the wind by a vane fastened to the opposite side of the shaft. The force of the wind is graduated by a disc of wood or sheet metal secured to the shaft. The wind wheel has the inclined vanes permanently secured to the rim and hub, and is fitted to the shaft with a feather, so as to slide along the shaft. It is usually kept some distance in front of the disc by a helical spring, but when the force of the wind increases, the wheel is made to approach the disc, and the passage for the air between the two is contracted, and the velocity of the wheel is thus checked.

[Printed, 10*d*. Drawing.]

A.D. 1855, April 25.—N° 942.

HUDDARD, GEORGE AUGUSTUS. — (*Provisional protection only.*)—Power is obtained from two sets of buckets, one carried by endless chains set up vertically or nearly so, and the other attached to the periphery of a wheel, the first set being worked by the discharge of an overshot stream of water, spherical or other weights, whereby greater power is obtained than if the stream were caused to act on an ordinary bucket wheel. This power is employed to work a bucket wheel which carries the water discharged from the endless chain. When it has attained the required elevation it is discharged and used again as the motive power. The power of the descending water or weights, minus that required to work the bucket wheel, is applied to drive machinery.

[Printed, 4*d*. No Drawings.]

A.D. 1855, April 28.—N° 959.

WARREN, DANIEL.—The mode of obtaining motive power shewn in this invention, consists in having a cylinder with a suction pipe having a valve at the bottom, in which a vacuum is formed by exhausting the air in the cavity between the piston and the top of the cylinder by any suitable means through a cock fixed into the upper part of the cylinder. The acting principle in the machine is the upward flow of the water forced up the suction pipe

by the atmospheric pressure. The re-acting principle is the weight of the water aided by a spiral spring placed above the piston. This mode of obtaining motive power is applied to giving rotary motion by placing two such machines side by side, the piston rod of each acting alternately against expanded cogs or projecting leaves of a mill, and pressing each up to the extent of the rods' ascent, when a ratchet wheel prevents the descent of the cogs. The rod having attained its full height presses a wire or rod in communication with a valve between the barrel and suction pipe, cuts off the communication, and stops the upward pressure of the water. The piston then sinks, and at the bottom touches a spring which opens the valve. This arrangement is preferred to the other mode of working by the pressure of the spring. The same principle is applied to the construction of pumps, packing presses, fire engines, and other machines which are actuated by alternately exhausting and re-admitting air, or by forcing in and compressing air on one side of the piston of a cylinder.

[Printed, 1*s*. Drawing.]

A.D. 1855, May 1.—N° 974.

KNOCKER, George Wigzell.—"Improvements in motive "power by means of air and water."

"Water unsupported by a base falling from the force of gravity "is not prevented by a vacuum above it. This, which is seen in "the common occurrence of a vessel full of water inverted, is "accompanied with the phenomenon of the air rising up to "restore the equilibrium as fast as the water falls. With regard "then to an inverted cylinder from which the water is withdrawn "the merits of the principle consist in producing a momentary "suspension to the re-establishment of the equilibrium and isolating from the vacuum those parts necessarily connected in the "working of the mechanism." There are two tanks, an upper and a lower, each with two cylinders whose pistons work two horizontal crank shafts, connected by a vertical shaft and bevel wheels. Two vertical cylinders are also connected with the lower tank, and from each tank pipes lead to a reservoir placed above them. Air tubes, with weighted covers moveable on hinges, are screwed into the tanks. In the covers are spindle valves opening in vessels, and small tubes are fixed at the bottom of the air *tubes*. The water in the vertical cylinder falls from the force of

gravity, and that in the air tube rushes down to restore the equilibrium, but, before it has run out, the piston of the vertical cylinder has reached the bottom, and the water is taken up by the enlarged capacity of the horizontal cylinder. The valve of the tube to the reservoir then opens, the tank is filled, but the pressure of the air in the head of the column from the reservoir is unsustained with respect to the vertical cylinder. When the engine is once set in motion, there is no reason why it should not go for ever.

[Printed, 10*d*. Drawing.]

A.D. 1855, May 5.—N° 1008. (* *)

PECOUL, Henri Gustave Adrien.—Generating the vapour of sulphuric ether and applying it as a motive power in place of steam. Spiral copper tubes within the cylinder two-thirds of an inch in diameter are coiled three or four times and fixed to each end of the cylinder ; a current of steam flows through the spiral tubes from the boiler beneath the cylinder. The ether drawn by a force pump from the condenser is conveyed into the receiver heated by steam from the boiler, by means of a spiral tube or worm a part of the ether is vapourized, the pressure of which forces the ether through a tube placed at its lowest part into the two slide valves of the cylinder, which work in a steam chest, with ports for the ingress and egress of the ether. When one of the ingress ports come opposite the tube it conducts the liquid to the spiral tube inside the cylinder. An alternate motion communicated to the slide valve by an eccentric each time the eduction port comes opposite the conducting pipe a quantity of ether enters the cylinder, and coming in contact with the heated surface of the spiral tube is reduced to vapour, which propels the piston with a force corresponding to its temperature; and then enters the condenser, which consists of a series of inch tubes fixed to the top and bottom of the cylinder, as in tubular boilers, and which are kept cool by water pumped through the tubes.

[Printed, 8*d*. Drawing.]

A.D. 1855, May 7.—N° 1011. (* *)

BALESTRINO, Henri, Marquis de.—(*A communication.*)—(*Letters Patent void for want of Final Specification.*)—" Improve-" ments in obtaining motive power by the aid of explosive " gases."

This invention is carried out "by inserting alternately at each "end of the cylinder containing a piston a small quantity of "mixes gases, and exploding the same by means of a current of "electricity from a galvanic battery," the piston will thus "be "driven alternately from end to end of the cylinder." Atmospheric air and hydrogen gas in certain proportions are drawn into and mixed in the cylinder by means of cut-off valves at each end. "A suitable arrangement of mechanism is employed for "making and breaking the electric circuit, and thereby ensuring "the explosion of the gases immediately the supply is cut off "from the cylinder."

[Printed, 4*d*. No Drawings.]

A.D. 1855, May 8.—N° 1033.

NEWTON, Alfred Vincent. — (*A communication from J. Ericsson.*)—"Air engine."

The application of the caloric is identical with that in the air engine described in the Specification, No. 6409, A.D. 1833.

In this invention there are two single acting engines connected by a crank shaft. The working cylinder of each engine has two pistons, the outer or "working piston," having a self-acting valve opening inwards. At the end of the outward stroke the inner or "supply piston" is made by means of a cam to move backwards with considerable rapidity to the end of the cylinder, where it remains stationary. The working piston then moves backwards, and in so doing compresses the air, which has, during the motion of the supply piston, entered through the valve in the working piston. At the commencement of the outward stroke of the supply piston, a portion of the compressed air is driven through a valve into a regenerator heated by the hot exhaust air from the cylinder, and thence passes to an air-heating apparatus heated by a furnace. The hot air from this apparatus supplies the cylinder.

[Printed, 8*d*. Drawing.]

AD 1855, May 25.—N° 1186.

ALDRIDGE, Edward.—"Improvements in meters for measur-"ing the flow of liquids and fluids, which can also be employed "for obtaining motive power," consist "in the employment "of a flexible diaphragm fitted inside of a spherical or other

" suitably shaped vessel, into which water or gas is alternately " admitted and expelled, through a slide similar to the slide " valve of a steam engine, and which is worked by a rod passing " through a stuffing box at one side of the vessel, and connected " to the flexible diaphragm." "To employ this meter as a motive " power engine, the rod passing through the side of the vessel " continuing the diaphragm has to be connected to the machinery " to be worked. An engine may have two rods" passing through opposite sides of the vessel.

[Printed, 10*d*. Drawing.]

A.D. 1855, May 28.—N° 1216. (* *)

DE MORIÈS, Frédéric.—(*Provisional protection only.*)—" Im- " provements in obtaining motive power."

" The machinery I use for this purpose consists in the main " parts of a vertical shaft, with a lever or arm that is loaded with " a given weight, the upper portion having a trunnion which turns " in a circular iron bearing. By turning the lever a motive power " is imparted to the trunnion, which will be in proportion to the " weight hung on the lever, and is communicated by means of " cranks, a connecting rod, and racks to bevel gearing, which " sets in motion a recipient engine of any kind with a fly-wheel."

[Printed, 4*d*. No Drawings.]

A.D. 1855, June 26.—N° 1454. (* *)

BELLFORD, Auguste Edouard Loradoux.—(*A communica- tion.*)—A rotary engine.

A drum revolves within a shell or case, the action of which is placed eccentrically to the axle of the drum. There are three longitudinal slits across the periphery of the drum, in each of which is a fan or sliding piston.

These sliding pistons are upon an independant axis inside the drum, and excentric to the axis thereof, so that, as the drum is revolved, they are projected beyond the surface of the periphery of the drum across the steam or air space to form a fan or piston whilst traversing the compartment between the induction and eduction openings for the motive fluid.

The machine may be applied, as a blowing machine, as a pump to raise water, and as a fluid meter.

[Printed, 8*d*. Drawing.]

A.D. 1855, June 27.—N° 1467.

SWINBURNE, THOMAS.—" Obtaining and applying motive " power."

The improvements in applying motive power consist in providing certain means for applying rectilinean impulses in one direction only to the same recipient for the production of rotary motion, which is effected by toothed wheels and clutches; also in applying motive power to the circumference of a wheel by impact. The motive power is obtained in vessels by a pair of paddles driven by the momentum of the vessel against the water, and till the vessel gets under way allowed to be turned freely. The shaft of the paddle has a wheel with small projections, which impinge on a wheel on a second shaft. This shaft is cranked, and works exhausting or compressing cylinders, of which the pistons at first move freely, but when the vessel is under way valves are turned, and the compression or exhaustion commences. In railway trains the axle of the driving wheels has a heavy impact wheel, which impinges on a weighty fly-wheel, the shaft of which is furnished with compressing or exhausting apparatus. "By proper " management not only will the current expenditure of power be " in great measure, if not entirely, replaced, but the enormous " amounts of momentums, now always wasted and thrown away " every time a train is stopped, will be saved and treasured up, or " used again in starting the train."

[Printed, 1s. Drawing.]

A.D. 1855, July 11.—N° 1544.

PRATT, HENRY.—(*Partly a communication from Edward Harrison.*)—Improvements in steam flour, wind and water mills.

The wind mills have an opening about the middle of their wind side, which aperture extends over the whole breadth. The parts of the side above and below the aperture are slanted inwards to direct the wind to the aperture. After passing in the wind is collected and pressed through a large central induction opening at the bottom of a wheel or reservoir which turns on an axis, which is also the axis on which the stone works. The hollow wheel has four eduction vertical openings on the periphery formed by the sides of the wheel which are curved spirally and constitute vanes, against which the wind presses and escapes through the

openings, the angle given to the sides regulating the velocity as in windmill sails or turbines.

[Printed, 3s. 6d. Drawings.]

A.D. 1855, July 12.—N° 1560.

EDWARDS, FREDERIC HOWORTH.—The heated air and gases derived from a close furnace inclosed in a casing or boiler are forced into the lower part of the boiler by a wide valve, and so as to deposit the dust at the bottom of the boiler, where it may be from time to time blown off by sludge cocks. The heated air rises and meets with wire gauze or a perforated diaphragm, which divides it into a multitude of fine streams or bubbles and brings it into intimate contact with the water. The temperature of the air and gases is thus reduced so as to prevent them acting injuriously upon the working parts of the engine, and a portion of the water is converted into steam which passes with the air and gases into the engine. On leaving it the steam and products of combustion are conducted through a refrigerator, consisting of a series of tubes passing through a vessel traversed by the fresh air in its passage from the air pump to the furnace, and from the refrigerator the steam and products pass under a diaphragm of wire gauze in a vessel which contains the feed water for the boiler, which is thus warmed. The furnace is supplied with fuel from a close box by means of an archimedean screw regulated by the rising and falling of the grate which is effected by the weight of the fuel or the grate, and by a counter weight.

[Printed, 10d. Drawing.]

A.D. 1855, July 20.—N° 1642.

JOHNSON, JOHN HENRY.—(*A communication from Andre Koechlin, Napoléon Joseph Vicomte Duchatet, and Joseph Antoine Auguste de Perpigna*).—Machinery worked by air, whether compressed or rarefied, or other fluids, composed of two revolving cylinders fitted each with spiral grooves and projections which gear together. One or both spirals may be made to project while the other spiral is a groove, or they may be made in the form of a series of teeth, the curves of the hollows of which are drawn carefully from the curve traced by making two primitive circles roll one over the other so as to prevent any escape between the threads and the casing. The cylinders rotate in a chamber fitted close,

the air or other fluid being admitted at one end and allowed to pass off at the other after having acted on the spirals. The entrance port may be momentarily covered by a pinion, so as to make the engine work expansively, or this may be effected by the helices being made at first to present a small surface to the action of the steam, which surface gradually increases till it is a maximum at the completion of the revolution.

[Printed, 1s. 4d. Drawings.]

A.D. 1855, July 26.—Nº 1693. (* *)

SCHIELE, CHRISTIAN.—" Improvements in obtaining and ap-" plying motive power."

This invention relates principally to improvements on the rotary engine, described in the inventor's previous Specification, No. 13,965, Old Law.

A "runner" or wheel fixed on the main axis of the engine has on its external periphery a series of channels or ducts. The runner revolves within an annular chamber in steam-tight contact with its internal periphery. The steam entering the annular chamber from the regulating valve, passes through the induction apertures and thence into the channels formed in the periphery of the runner, and wherein the force of the steam is expended; and it then passes laterally out of the channels into the interior of the casing, in which a vacuum is maintained by a communication with the condenser. The runner axis and propeller are thus put into rapid motion, at the same time water is supplied to the condenser, and the heated water and air are evacuated by the rotary pump.

The formation of the tangential aperture and methods of adjustment of several modifications of the preceding are described.

" Friction contact wheels" are applied to transmit rapid motion from the engine so that the pressure for adhesion is nearly balanced by opposite pressure. Air is evacuated or propelled by combining or intermixing it with water in its passage through a fan or centrifugal pump.

Printed, 1s. 2d. Drawing.]

A.D. 1858, August 6.—Nº 1775.

GEDGE, JOHN.—(*A communication from Aristide Ratte.*)—(*Provisional protection only.*)—An apparatus for employing "air as a

"motor," composed of wings placed in a horizontal position round a vertical shaft. Each pair of wings are placed on a horizontal axle. To this axle is adapted two frames intended to act in a rectangular direction, and separated by the upright shaft aforesaid.

"The framings are to be so made that those wings which are "not acted upon by the wind shall always maintain a horizontal "position, and offer no resistance thereto while the rest are in "course of action."

[Printed, 4d. No Drawings.]

A.D. 1855, August 7.—N° 1789. (* *)

MURPHY, WILLIAM JEREMIAH.—(*Provisional protection only.*) —Obtaining motive power.

"The application of the vapour or steam produced from spirits "of wine, or any other spirituous liquors, as a moving power in "the boilers of marine, locomotive, and other steam engines, and "the condensation of such vapour or steam, after having been "used, and feeding the boilers therewith, thereby preventing "incrustations in boilers."

[Printed, 4d. No Drawings.]

A.D. 1855, August 24.—N° 1919.

RADIGUET, TOUSSAINT AUGUSTE.—(*Provisional protection only.*)—A motor wheel with square cases all round its circumference is fed through a distributor by a feed wheel containing heavy iron balls. There is a supplementary distributor to regulate the feed of the balls, and to contain a reserve of them while discharge distributors convey the balls back from the motor wheel after having made it rotate to the feed wheel.

[Printed, 4d. No Drawings.]

A.D. 1855, September 26.—N° 2148.

NASMYTH, JAMES.—Motive power is obtained from the pressure of the atmosphere by means of a piston travelling in a circular tube provided with two valves to admit the air, two other valves communicating with air pumps, and two divisional valves which ordinarily divide the tube into two chambers, but which may be pushed back by the piston. The piston is connected by an arm or plate passing through a slit in the tube to the shaft,

which works the air pump. To work the engine air must be exhausted in front of the piston, and the admission valve behind it opened. The pumps are then made continually to exhaust the air in front of the piston.

[Printed, 1s. 4d. Drawings.]

A.D. 1855, September 29.—N° 2173.

CHADWICK, David; FROST, Herbert; HANSON, George, and CHADWICK, John.—Improvements on the invention comprised in the Specification, No. 773, A.D. 1853.

The improvements consist in two methods of using the flexible bag. In the first, a rectangular piece of flexible material is attached by its sides and one extremity to a plate within a casing. The fluid or gas to be measured enters by a tube between the plate and the flexible material, and by its pressure causes rollers to revolve which are mounted between two discs on the same axis. There are three of these rollers which bear on the surface of the flexible material. The second method consists in wrapping the flexible material round a hollow cylinder contained in the cylinder. A roller is mounted by its axis in slots of two standards, and bears by its gravity on the material. The fluid enters the cylinder, and thence the space between it and the flexible material. This material is closed or fastened at one end to the cylinder by a ring of metal, is but open at the other end. The fluid pressing on the roller, which acts as an abutment, causes the cylinder to revolve. The arrangements are applicable to motive power engines to be worked by water or other means.

[Printed, 10d. Drawing.]

A.D. 1855, October 3.—N° 2205.

GREAVES, Thomas.—(*Provisional protection only.*)—This relates to improvements on the invention described in the specification, No. 283, A.D. 1852.

Only one shaft is used, which runs through the beam and through two large bevil wheels. One end of the beam forms a shaft for two pinions rivetted together, which gear into the bevil wheels, each of which has two half rims, one rim gearing into one of the pinions, and the other forming an outer or larger circle and gearing into the other pinion, the two half circles forming a complete circle. By the arrangement the weights are brought

up on the large wheel exactly perpendicular with each other, one straight down, and the other straight up at each half revolution, and going in contrary directions, and balancing each other. Two spur wheels are used instead of the water wheel; one on the same shaft as the large wheels, and rivetted to one of them; the other on a shaft worked by a crank connected with the end of the beam opposite the pinions. The weights are drawn in by a connecting rod from an eccentric, and are thrown out as they descend.

Two sets of the wheels are used, one working at half centre, while the other is at quarter centre, and thus completing the revolution of the crank shaft.

[Printed, 4*d*. No Drawings.]

A.D. 1855, October 12.—N° 2287.

STAADT, ADOLPH. — (*Partly a communication from Bernard Schroeder.*)—(*Provisional protection only.*)—Two or more cylinders are fixed to a suitable axis which turns in bearings. In each cylinder is a weighted piston, and steam or other elastic fluid is alternately admitted to the two ends of the cylinders, so as to lift the pistons from the ends of the cylinders below the axis of motion to the ends for the time uppermost, so that as the cylinders pass the vertical position the pistons may be at the highest point, and by gravity cause the end of the cylinders which are uppermost to descend, by which a constant rotatory motion is obtained.

[Printed, 4*d*. No Drawings.]

A.D. 1855, October 15.—N° 2304. (* *)

BENTON, ROBERT.—(*Letters Patent void for want of Final Specification.*)—" Improvements in obtaining motive power by " leverage."

" This invention has for its object the means of keeping a barrel " or wheel in continuous motion by the successive application of " any even number of levers acting entirely independent of each " other, and in eccentric instead of the customary circular orbits; " for which purpose eccentric planes are employed, and each lever " on successively coming in contact with such eccentric plane or " planes is for the time being elongated and rendered a long lever " with a short shank; and having passed through or over such " plane or planes it immediately becomes neutralised on the rising " side of the barrel or wheel to which it is attached, by being so

"fixed as to form one side of a cube figure, either square or "octagonal, and in that position it is carried round the moving "barrel or wheel until its pivot returns to the point from whence "it was first placed against the face of the eccentric plane."

[Printed, 4*d*. No Drawings.]

A.D. 1855, November 3.—N° 2461.

COOPER, Thomas Robert.—(*Provisional protection only.*)— "Obtaining motion with power and velocity by purely mechanical "means."

"Motion is obtained by a certain combination and position not "hitherto known or adopted, and according to the structure of "the said machinery the requisite power and velocity are also "obtained."

[Printed, 4*d*. No Drawings.]

A.D. 1855, November 13.—N° 2551.

WILSON, Fischer Alexander.—"Improvements in engines, "machinery, and apparatus for exhausting, forcing, and lifting "for propelling in land and water."

Part of the invention consists in a method of raising water in large quantities. A vacuum may be obtained from the gravitation of the water thus raised. And this hydro-pneumatic power is used to work a stationary engine with a fixed cylinder having a short stroke and large diameter. The packing is made of lignum vitæ or other hard or compressed wood, which is also used for the bearings, bushes, and other wearing surfaces.

For propelling a train a continuous valve box, divided into sections of one, two, or three hundred feet by transverse plates, and communicating with the hydro-pneumatic exhausting apparatus by separate junction tubes furnished with valves which open only while the train is passing is placed in the centre of each line of rails. The engine consists of a travelling vacuum with an eduction box raised and lowered, so that its mouth may enter the valve box below or be lifted out. When the eduction pipe is connected with the continuous vacuum the air is admitted into the cylinders, and by its pressure on the pistons propells the train. Each engine has 2, 4, or 6 cylinders.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1855, November 19.—N° 2607. (* *)

GILARDEAU, Michel Pierre Alexis.—(*Provisional protection only.*)—" A new motive power."

"The invention consists, first, in using a certain quantity of " liquid, equal to a weight of at least three atmospheres, to com- " press the air alternately into two parallel pumps, thereby obtain- " ing a power equal to the weight employed; secondly, to make " use of the compressed air for propelling a horizontal cylinder in " which a vacuum is produced; and, lastly, to compel the weight " employed for compressing the air to pass from one side of the " apparatus to the other."

[Printed, 4*d*. No Drawings.]

A.D. 1855, November 23.—N° 2640.

TUCKEY, Thomas.—Steam, vapour, or gas are used more conveniently and suitably for locomotion on common roads by replacing the ordinary cylinder and piston by flexible bags alternately dilated and contracted. In one form of the invention there are two terminal fixed discs and a moveable central piston disc connected with the other two discs by flexible belts or tubes. The two chambers are alternately expanded. The central disc may be fixed and the end ones moveable. Motion may also be obtained from cylinder bags longer collapsed than when distended, so that the distension of it will enable a rope to drag a crank. It may also be obtained from a hollow belt or bag pressed between rollers like those of a rolling press, which bag will, if inflated at each end alternately, tend to pull itself out from between the rollers and give them an oscillating rotary motion, or if the bag be passed loosely round one of the rollers, and the ends fastened together, a direct circular motion may be obtained.

[Printed, 8*d*. Drawing.]

A.D. 1855, November 28.—N° 2689. (* *)

WOLFF, Samuel.—(*Provisional protection only.*)—" Improve- " ments in obtaining motive power."

This invention is based on the law that a body placed in a fluid of greater specific gravity than itself will tend to rise and one in a less specific gravity to fall. An endless hollow or light chain is constructed, the links of which when put together

present the appearance of a cylindrical cord or band of a uniform diameter throughout its length. "This chain I mount "upon a pair of guide wheels, which are capable of adjustment "to bring the chain to tension, and I cause the chain to traverse "through one or two vertical cylinders. The cylinder through "which the chain travels upwards I fill with mercury, water, or "other heavy fluid, and I cause the chain to enter at the bottom "of the cylinder, which I close with a proper valve or stuffing-"box to keep in the fluid; and when I employ two cylinders "I pass the chain down the second cylinder, which I fill with "hydrogen gas, and close it at its ends to retain the gas in the "cylinder." A continuous rotary motion is imparted to the endless chain, by the tendency of the mercury or other fluid in the first cylinder to force it up while the hydrogen allows the gravitating principle to take effect.

[Printed, 4*d*. No Drawings.]

A.D. 1855, December 10.—N° 2785.

FONTAINEMOREAU, Peter Armand Le comte de.—(*A communication.*)—Heated compressed air engine, which consists of a closed furnace lined with refractory earth, or clay, and supplied with compressed air by a force pump, and with fuel from a hopper with two slides worked by handles attached to rods, working in stuffing boxes by which the escape of the air during the introduction of the fuel is prevented. A compartment of the furnace is formed by a partition also lined with refractory earth or clay and receives the products of combustion which afterwards pass through a conducting pipe in which are zig-zag partitions to stop solid particles. They enter a motive cylinder with an internal cylinder in which the piston works. The waste air circulates in the space between the two cylinders and escapes to a regenerator furnished with a number of tubes through which the air from the force pump is driven to the furnace and in which it is heated by the waste air. The waste air is finally discharged into the atmosphere. A right is reserved to add an additional cylinder, to employ chloroform or sulphuret of carbon, and also to add water in the regenerator to charge the hot air with vapour.

[Printed, 8*d*. Drawing.]

A.D. 1855, December 13.—N° 2820.

JOHNSON, JOHN HENRY.—(*A communication from the Company "John Cockerill."*)—Apparatus for containing and distributing æriform fluids, whereby such fluids will be supplied to a motive power engine at or near an uniform pressure.

It consists of two parts; a receiver composed of a number of tubes closed at their ends and opening by branch pipes fitted with stop cocks into a box from which a pipe leads to the bottom of the distributor, and a distributor which is a strong vessel having a plug or rod whose lower end acts as a valve to the opening of the pipe leading from the receiver, and whose upper end passes through a stuffing box in the cover of the vessel and terminates in a piston fitted into a small cylinder closed at the top. The rod has a passage for air to pass into the small cylinder from the receiver and the two ends are made of equal diameter so that the rod is not affected by the pressure of the fluid from the receiver. The rod may be raised or depressed by a lever acted on by a second rod. This rod also terminates in a piston fitted to a small cylinder to which fluid passes from the vessel distributing and serves to depress the rod. A spring which can be regulated by a nut to bear a given amount of pressure serves to raise the second rod when the pressure of the fluid in the second small cylinder and the large vessel sinks below the given amount and by this means raises the plug from the opening of the tube from the receiver.

[Printed, 10*d.* Drawing.]

A.D. 1855, December 13.—N° 2821.

JOHNSON, JOHN HENRY.—(*A communication from the Company "John Cockerill."*)—"Apparatus for containing compressed "air or gases, and supplying the same to prime movers (in lieu "of steam) at a constant and regular pressure."

One or more receivers are connected with the generator of the compressed air or gases by a pipe at their upper sides, and an extension of the pipe conducts the air or gases to the prime mover. The lower part of the receiver communicates by a pipe with stop cocks with a tank or water reservoir which is placed at a considerable elevation above the receiver, and has a capacity greater than all the receivers combined. By admitting a head pressure of water inside the receiver from the tank the compressed

air is kept and supplied to the prime mover at a constant and regular pressure. The apparatus may be applied to railway locomotion by a propulsion tube beneath the line constructed to receive the compressed air.

[Printed, 8*d*. Drawing.]

A.D. 1855, December 22.—N° 2907.

ZAHN, William Henry. — (*Provisional protection only.*) — Windmills are made self-regulating by causing the wind to act on movable or rotating spindles. A wheel is rigidly attached to a shaft supported or mounted on suitable bearings, through the rim of which wheel the spindles pass to the boss, and are prevented from returning by collars. Two heads fitted loosely on the shaft, one on each side of the wheel, are connected by rods: on the outer head are levers fastened to the ends of levers attached to the spindles. On a forked lever fitting in a groove, in the inner head is a weight sufficiently heavy to cause the sliding heads to move forward and present the edges of the sails to the wind. A long lever provided with a weight to counterbalance that on the bent lever acts on this lever and causes the sliding head to move back. Springs may be used instead of the weights and levers, or a ball governor may be adopted. Another mode may be adopted by fixing on the spindles small cog wheels or pinions worked by racks connecting the two sliding heads.

Another mode is of attaching one end of a spring of vulcanized indian-rubber, caoutchouc, or metal to the sails, and the other end to the shaft or wheel before mentioned, so that when the wind exceeds a given power it shall cause the surface of the sails to be lessened.

[Printed, 4*d*. No Drawings.]

1856.

A.D. 1856, January 22.—N° 170. (* *)

PORTEOUS, Dundas Smith.—Rotatory engine.

The enclosing cylinder is stationary. It is parted between its end plates into three compartments by two partition plates. Each compartment has a "wyper" or rotatory piston framed on the

main axle, and placed at equal distances round. Three "flaps," or abutment valves placed round the inner periphery at equal distances from each other, are hinged at one end to the enclosing cylinder, and fall into recesses in order to allow the rotary pistons or wypers to pass over the back of the abutment valves and continue their rotation. A hollow cylindrical roller extends the length of the three cylinders, and parallel with their common axle. The roller has three ports on its circumference and acts as a valve. One port before each cylinder placed at equidistant parts round it and the valve is moved by a spur wheel on the shaft driving another on the valve, is opened and shut by the rotary piston passing the orifice, "when one of the cylinders is inactive, the "wyper having passed the port of discharge, and not having "arrived at the port from which it is to be again supplied for "the next revolution, the other two cylinders being under the "pressure of the steam" gas, or other propelling agent are in operation.

[Printed, 10*d*. Drawing.]

A.D. 1856, January 26.—N° 211.

JOHNSON, JOHN HENRY.—(*A communication from Jean Pierre Louis Florimond Datichy.*)—(*Provisional protection only.*)—"Com-"pressed air locomotive engines."

"A small steam engine and boiler to be carried on the main "framing of the locomotive for the purpose of working two or "more double action air pumps, which compress the air into a "receiver" whence it is delivered to the "main actuating cylinders "of the locomotive."

"By this arrangement a smaller engine and boiler will be "required," fuel saved, and motive power increased "by the "working of the air pumps during the stoppages at stations."

[Printed, 4*d*. No Drawings.]

A.D. 1856, February 1.—N° 271. (* *)

MACPHERSON, ALLAN.—(*A communication.*)—(*Provisional protection only.*)—Obtaining and applying motive power by combining "the expansive forces of steam and air, and with this "combination" obtaining "as much power from twenty-five "pounds of coke, as is now produced in the locomotive or other "engine by the burning of one hundred pounds or more of that "article."

The patentee further "proposes to form a reservoir for com-" pressed air near and below the furnace, and under the usual" cylinder and pipes to pass the air through the furnace, from" whence it will proceed through conduits, and form a junction" with the steam, and will be, thus combined, used as a motor" much in the ordinary manner; but with some mechanical" additions to facilitate the working."

[Printed, 4*d.* No Drawings.]

A.D. 1856, February 1.—N° 286. (* *)

JOUBERT, Charles Catherine, and BORDIER, Leon André.—"Improvements in motive power engines."

The invention consists in "the application of a multiplex thread" screw to a driving shaft for transmitting motion so as to mul-" tiply the power of action." A thread screw forming the extension of a shaft upon which a piston paddle (rotating piston) is keyed, works into a cylinder having openings for the ingress and egress of the steam, and also a fixed inner partition or diaphgram. When the engine is in action the steam is admitted between the piston handle and the fixed partition or abutment. It acts on the paddle and carries it into a circular motion. The steam is then introduced into the other compartment, and impels the paddle into the opposite direction; these movements produce vibrating motions in the crank, which transmits the same vibrations to the screw, but this being supported by its journals the female screw or nut is compelled to effect between slide bars the to-and-fro motion of common engines, and the connecting rod and crank transmit circular motion to the driving shaft carrying the fly wheel.

"A modification of the same kind of apparatus or mecha-" nism may be introduced between the motive agent whether" water, wind, manual, or other power, and the driving purpose to" which such power is applied, modified, and arranged as may" be required."

[Printed, 10*d.* Drawing.]

A.D. 1856, February 11.—N° 353.

ZAHN, William Henry, and WELLS, Joseph Henry George.—Windmills are made with the spindles of the sails passing through bearings on the side of the rim of a wheel on the shaft.

On the spindles are small arms, to the extreme ends whereof pieces of vulcanized india-rubber acting as springs are attached. The other ends of these pieces are fixed to a sliding head on the shaft which can be made to turn with it by a key fixed on the shaft, fitting into a corresponding cavity in the head. The head can be moved nearer or further from the sails by means of a forked lever worked through a vertical rod, by which means the sails may be set for any velocity. When the wind increases beyond that velocity the springs will act on and lessen the surface of the sails.

[Printed, 8*d*. Drawing.]

A.D. 1856, February 21.—N° 441. (* *)

JOYEUX, Louis Auguste.—(*Provisional protection only.*)—An apparatus in which the combined use of steam and dilated air, or easily evaporating liquids, produces motive power at a small cost.

Steam is mixed with dilated air and produces a vapour of moderate pressure, which is brought to bear on the engine in the usual manner. "When this vapour has worked in the atmospheric " machine it is sent into another machine containing the liquid " to be evaporated, ether for instance; the water condenses in " this apparatus, and the air deprived of a portion of its heat; " the ether is thus brought to a state of evaporation without cost " of fuel, and of which the steam when brought to a suitable " pressure feeds the cylinder of another (the ether) machine; the " condensed water that still retains a certain portion of heat is " made to return to the boiler, and receives the surplus heat re- " quired for its evaporation." "The supply of air in its generator " is made by a special apparatus which feeds the cold air by " absorption, and sends the air arrived at a certain degree of heat " into the machine for volatilizing ether. The apparati for dilating " the air and evaporating water are placed over the same furnace, " the ascending flames reach the sides of the atmospheric appa- " ratus, pass into the chimney after having traversed a flue " where its combustible gases are burnt, and through the ether " volatilizing apparatus where it loses the remaining portion of " its heat."

[Printed, 4*d*. No Drawings.]

A.D. 1856, February 23.—N° 463. (* *)

JONES, David.—(*Letters Patent void for want of final specification.*)—" Obtaining motive power by the combined action of air, " water, or other fluids on each other."

" An important feature in this invention consists in so con- " structing and operating with the apparatus that there is no " appreciable friction of the principal parts thereof, and con- " sequently no wear of the material of which they are made, " thereby effecting economy in the expense of the apparatus; " the power generated and maintained in the apparatus for an " indefinite period is also attended with no expense."

The machine consists of two vessels, one open; the other is cylindrical closed at one end, and placed upright in the former, with the open end downwards, both being filled with water. A hollow collapsible sphere filled with air is placed within the upright vessel. Tubes furnished with cocks lead from the upright vessel and the sphere to the air, and also from the sphere to the upright vessel. This vessel is connected to the bent arm of a vibrating lever and to a weight. The upright cylinder moves up and down by the water in it being successively displaced by air, and by the hollow sphere alternately expanding and contracting, the cocks which admit and emit the air and water can be actuated by the motion of the machine itself.

[Printed, 4*d*. No Drawings.]

A.D. 1856, February 25.—N° 481.

ARNIER, Louis.—" Condensing hot air and obtaining motive " power therefrom."

The apparatus consists of " a rarefier," " in which the atmo- " spheric air is heated." It is made of cast iron placed over a fire-place, and surrounded by vertical flues. Secondly, of a cylinder and piston. Thirdly, of " a condenser which sucks the " air out of the cylinder" into tubes surrounded by cold water. And fourthly, of the an air-pump which pumps the air out of the condenser. The atmospheric air passes to the rarifier through small tubes placed within the tubes conducting the hot air out of the cylinder.

Drawings are referred to in the Specification, but none were filed.

[Printed, 4*d*. No Drawings.]

A.D. 1856, March 6.—N° 561.

JACKSON, Luke Duncan, and MYERS, Henry.—(*Provisional protection only.*)—" Combining air and water as a power."

" Cylinders are placed on a bed plate as low as possible to " obtain the greatest amount of density, each cylinder having " two inlets and two outlets, or more if required, each inlet being " arranged so as to be as near as possible to head of water to " avoid friction." " In the bottom part of piston packing is " placed to collapse piston object." The piston contains condensed air supplied from a condenser, in a sufficient quantity to overcome atmosphere, on upper part of piston so as to give first motion if density of water is below atmospheric pressure. The upper part of the downward pistons extracts air from the upper part of the upward piston. " The plunger so made to form a " vacuum under piston of engine on the downward stroke, and at " the extremity of stroke to get rid of water in a simple way " by means of a cam working the eccentric opening the plunger " in succession."

[Printed, 4*d*. No Drawings.]

A.D. 1856, March 22.—N° 678. (* *)

JONES, John, and SHIRREFF, Alexander Cunningham.— " Rotatory motive power engines capable of being worked by " steam or other fluid pressure."

This engine consists of a fixed external steam cylinder having its axis in a horizontal direction, and enclosed by two end covers through which the rotating power shaft is carried; within this is another but smaller cylinder or "rotating drum," with its axis placed excentrically to that of the outer cylinder, and with three slots in its periphery radiating to its centre; three pistons or " working diaphragms " fitted with spring pressed plates, work steam tight in and out of the slots against the concave surfaces of the cylinder. A roller placed horizantally forms a bearing surface to the inner ends of the pistons which are in continual contact with it, and their outer ends bear against the concave periphery of the outer cylinder. The ingress and egress passages are on opposite points of this cylinder. The steam enters by one of these passages, and acts on each piston in succession as it passes round; " the dead or reacting surface " being

obtained by the steamtight sliding contact of the rotating drum, with the concave surface of the fixed cylinder. The inner being excentric to the outer cylinder a space of a crescent form is left between the two, the steam acts upon the area of the pistons exposed in this crescent shaped space and as each piston comes round to the narrow part of the crescent, the side of the cylinder forces it into its slot, until it is wholly inserted within the periphery of the rotating drum. This inward movement maintains the roller in its concentric position, and as the pistons move round they are pressed into or withdrawn from the slots continually.

The rotatory engine is applied to move cranes, and other lifting and lowering apparatus, and to pumps.

[Printed, 8*d*. Drawings.]

A.D. 1856, March 28.—N° 751.

NEWTON, Alfred Vincent.—(*A communication from J. Ericsson.*)—(*Letters Patent void for want of final specification.*)—"An improved air engine for producing motive power by heated "air."

This invention relates to the air engine described in the Specifications, No. 6409, old law, and No. 1033, A.D. 1855, and "consists "in operating with one piston within a cylinder in such a manner "that one side of it shall compress the cold air which on the "previous stroke entered one end of the cylinder, and cause it "to pass through the regenerator and heater, or either, at the "same time that the other side of the said piston is receiving "the motive force of the heated air entering the cylinder from "the opposite direction." By this means the friction other than that caused by the differential pressure of the hot and cold air will be avoided, and the "leakage through the packing of the "piston will not occasion any loss of air." Two or three engines may be used together, "but the use of four is preferred."

[Printed, 4*d*. No Drawings.]

A.D. 1856, April 1.—N° 784.

HERBELOT, Armand Louis André.—(*Provisional protection only.*)—This is for obtaining "a continual motive power" by compressed air or other gas introduced into an air-tight case, which contains a shaft or spindle that has fixed thereto a helix

or thread of uniform breadth and thickness. The gas or fluid by exerting unbalanced pressures on abutments formed either at the extremity of the helix, or otherwise communicates rotary motion to the aforesaid shaft or spindle, and by means of it to an external shaft, by which machinery may be driven.

[Printed, 4*d*. No Drawings.]

A.D. 1856, April 2.—N° 801. (* *)

SAMUEL, James, and NICHOLSON, John.—" Improve-" ments in steam and other vapour engines."

This improvement consists " in employing three cylinders into " one only, of which the steam or vapour is directly admitted; " and after having been partially expanded in that cylinder, is " admitted simultaneously into the other two cylinders where " expansion may be carried out in its fullest extent." The steam from the main cylinder enters above the piston in one expansion cylinder and below the piston in the other.

The pistons in each cylinder are framed to a shaft with three cranks, the central crank being about at right angles to the other two.

[Printed, 6*d*. Drawings.]

A.D. 1856, April 26.—N° 1003. (* *)

ARNAUD, Claude Antoine.—(*A communication*.)—" Obtain-" ing motive power from steam and other fluids, and in pumping " and forcing water and other fluids."

A rotary engine is described capable of being worked by steam or other fluids. It is composed of two stationary cylinders, enclosed in a casing formed by the portions of two cylinders concentric with the revolving cylinders. At the two lines of meeting or contact of the casing, pipes and valves are placed, one to admit the ingress steam, and the other to open a way to the exhaust. Each cylinder has two "great teeth" projecting, at opposite points of its diameter, from its periphery, "and which " are provided with an appendage (or spring) of metal" to form a steam-tight rolling junction at their line of contact, or when the great teeth in their rotation come in contact with the inner concave surface of the cylinders; the steam from the ingress valve flowing into the channel of rotation presses a great tooth forward

until it reaches the exhaust, and passing over shuts it, opens the opposite exhaust and the egress steam orifices, and the rotation continues; the channel of rotation increasing and decreasing in its capacity. The engine may be worked expansively.

The exterior mechanism for working the valves, reversing the movements of the engine, and working the air and force pump are described.

[Printed, 1*s*. 2*d*. Drawings.]

A.D. 1856, June 6.—N° 1345.

LANG, DUNCAN.—(*Letters Patent void for want of Final Specification.*)—Motive power is, according to this invention, obtained from "the compressed air of the common atmosphere dispensing " with coal, coke, fire, and water by means of a cylindrical vessel " with hemispherical ends, having a revolving screw shaft passing " longitudinally through its center."

"On it the air presser travels, having valves opening to either " side according to the direction of its movement for regulating " the pressure by a release of the surplus power into the space it " leaves by its travel on whatever side it may be working from. " The shaft is turned by a ratchet lever or ratchet levers at each " side of its ends for alternating the action of the presser as either " side of the vessel becomes in turn emptied of the air for the " time acted on. With the two they are so arranged that while " one is turning the shaft, causing the pressure, the other vibrates " loose till the presser requires to be traversed in the opposite " direction, when the latter is brought into action, and the former " released. They are wrought either directly from the ordinary " shaft of the engine by an eccentric connection, or from any " of the other moving parts in the same relation according to " the construction of engine with an arrangement for revers- " ing the levers and alternating the travel of the air presser. " The cylinder and its arrangements, or any other reciprocating " or rotatory machinery with its necessary connections for com- " pleting the engine, communicates with the air holder by pipes " or passages in which valves are placed, so that while one main- " tains an open communication from the the pressure to the " machinery, the other is kept closed by the same means, till the " alternate action of the presser reverses their position. Valves " also are mounted on the ends of the air holder for supplying it

"from the external atmosphere, and others for the escapement
"of any extra pressure."

[Printed, 4d. No Drawings.]

A.D. 1856, June 9.—N° 1363. (* *)

SIEMENS, CHARLES WILLIAM.—Regenerative engine.

1. "In this improved steam engine the same steam is made to "exercise its elastic force, over and over again, for an indefinite "number of times, by being alternately compressed, heated, "expanded, cooled, and compressed again, and of which the "regenerative engines No. 12,006, A.D. 1847, and No. 326, "A.D. 1852, may be considered the type."

2. The power of the engines depending chiefly upon the increase of temperature the steam acquires during its passage through a "respirator" and over the surfaces of the heated vessel, it is of importance to raise the temperature of the steam to the highest practicable limit, and to reduce it immediately after, as near as possible to the point of saturation, avoiding partial condensation from a too great reduction of temperature.

3. In the improved engine the heating surface of the heated vessel is increased by corrugating its surfaces. 2. The cast-iron heated vessel is rendered more tenacious and durable by subjecting the material to any process of steel making previous to founding it. 3. Protects the vessel opposite the fire where it is first struck by the flame, by a shield of iron or steel, which is coated with a layer of fire-clay. 4. In the previous engine a boiler surrounded the working cylinder, and a wall of brickwork intervened between the two; that is now dispensed with. 5. Forms close chambers about the extremities of the working cylinder, round the regenerative boiler, and the passages connected with it, which communicate with the boilers and contain hot water and saturated steam. The large heated plunger is filled with powdered charcoal or other non-conducting material.

6. Relieves the working crank of the regenerative cylinder from strains produced by compression and expansion of the steam, by a weight attached to its piston.

7. Describes certain peculiar arrangements of "regenerative "steam engines" applicable to vessels moved by a screw propeller, by which a continuity of driving power is obtained by

means of one engine having two heating cylinders and furnaces placed in a line with the working shaft.

Describes several extensions and modifications of parts of the engine.

[Printed, 1s. 10d. Drawings.]

A.D. 1856, June 23.—N° 1470.

LONGRIDGE, James Atkinson.—Motive power in mines.

The invention consists in the use of compressed air forced into reservoirs by means of a head of water, or by suitable machinery above ground. Its expansive force is sometimes augmented by heat. The air may be compressed by an engine actuated by pressure of water, afterwards again lifted by the pumping engine, or by steam or animal power; or by hydraulic presses driven by a column of water obtained from the rising column of the ordinary mine pumps. The air is stored up in station reservoirs, and thence conveyed by portable reservoirs to the places where it is required. Its pressure may be rendered uniform by a valve formed by a piston which works in a cylinder, and is forced by a spring down, so that a pendent part having lateral openings is made to embrace a pipe also provided with openings, which coincide with those of the pendent part when the pressure of the air is below a fixed amount.

[Printed, 10d. Drawings.]

A.D. 1856, June 25.—N° 1496.

SCHELLER, Theofilo.—(*Provisional protection only.*)—Two shafts or spindles, free to revolve in suitable bearings, one vertical and the other inclined, are employed. On the upright shaft a pinion gears into a weighted toothed wheel on the inclined shaft. Over the pinion is a wheel larger than it, which comes in contact with and forces back one of four weights on and near the periphery of the toothed wheel. The weight opposite to that forced back is connected with it and so pushed up, thus altering the centre of gravity of the weighted wheel and making it to revolve, and so to bring the next weight in contact with the wheel on the vertical shaft.

[Printed, 6d. No Drawings.]

A.D. 1856, July 2.—N° 1561.

NEWTON, Alfred Vincent.—(*A communication.*)—" Air " engines."

There are two working cylinders, each consisting of a pair of cylinders, one placed vertically above the other, with a third cylinder of some badly conducting material between them. The lower cylinders are kept cold by water and the upper heated by a furnace. A pipe passes from the upper to the lower cylinder, and has at one part a "lung" or chamber interposed "filled with a rolled " sheet of wire gauze" put lengthwise. The working piston works only in the lower cylinder. Above it is a " dumby piston " composed of two cylinders with closed ends which work in the hot and the cold cylinders. At the beginning of the upward stroke of the working piston the "dumby piston" is forced up by means of a cam on the crank shaft, leaving a partial vacuum between it and the working piston, and driving the air from the hot into the cold cylinder through the pipe and lung. The working piston is then forced up by the pressure of the atmosphere on its surface, thus impelling the crank shaft. "The " cam by this time will have passed round, so that the dumby " piston rests on the working piston, and as the working piston " is forced up by the pressure of the atmosphere on the other " side, this one is forced down as the air expands in the hot " cylinder" "by reason of the caloric which it has absorbed in " passing in the reversed direction through the appropriate lung " and through the heated pipes." In this way the pistons are alternately operated.

[Printed, 10*d*. Drawing.]

A.D. 1856, July 11.—N° 1641.

DEMBINSKI, Henri.—(*Provisional protection only.*)—Self-acting motive power.

Two wheels connected by gearing or endless chains are moved by weights, one suspended inside the wheel by an eccentric, with a bolt in contact with the wheel ; the other suspended outside the wheels between their peripheries with an aperture to slide on two small bolts fastened to the wall.

Or, secondly, by elasticity. In this case pumps are used, the rods of whose pistons are made to press against the periphery of the wheels. To give strength a globe is placed in any convenient

position and a vessel filled with water or other fluid. In the globe is placed a second, containing compressed air or gas. To give " life and motion" water is forced by gearing connected with the wheels through a series of vessels, some containing a compressive globe, and is made to return to work again in tubes in the circumference of the wheels.

[Printed, 6*d*. Drawing.]

A.D. 1856, April 21.—Nº 1721.

GEDGE, JOHN.—(*A communication from Victor Cantillon.*)—(*Provisional protection only.*)—A dymanic effect four or five times greater than is at present obtained in steam engines is obtained from burnt coke, first, by " permitting compressed air to dilate or " expand while passing through the fuel (in the furnace) in a state " of combustion, and carrying it from thence to act as a motive " power by its pressure upon a piston, and next by obtaining a " quantity of steam proportionate to the burnt coke by the heat " given out by the air dilating or expanding in its passage " through tubes or conducts forming the heating surface." " All parts of the machine in contact with fire or hot air will " be surrounded by water."

[Printed, 4*d*. No Drawings.]

A.D. 1856, July 23.—Nº 1740.

BERTHIEZ, SAMUEL FREDÉRIC.—Engines to be worked by a new elastic fluid derived from sulphuric æther diluted with water containing other substances. The best relative proportions are seventy pounds of sulphuric æther, nine pounds of empyreumatic oil, one of animal fat, four gallons of water, sixty drachms of soda, and fifty of potash. The two last facilitate the condensation of the vapour. In some cases a quarter of an ounce of bicarbonate of soda and the same amount of tartaric acid may be added. The boiler in which this composition is placed is heated either directly or by being placed in an outer vesssel containing water, on which the heat plays. The vapor passes from the boiler to the cylinder, where it acts on the piston in the usual way, and thence into a tank where it expands and loses part of is heat, and then into a winding tube where it is condensed and is pumped back into the boiler. Fresh mixture may be added from a little

tank. To prevent leakage a rich mastic of lime and white of eggs may be used, or washers of wash leather applied.

[Printed, 8*d*. Drawing.]

A.D. 1856, July 24.—N° 1753.

PETSCHLER, HELMUTH CARL FRIEDRICH MARTIN.—(*Provisional protection only.*)—Motive power is obtained by employing an inner spur wheel gearing into an outer rim with teeth on its inner surface, and each rotating on its proper centre. A series of these wheels are placed loosely on a stationary shaft, upon which a heavy weight is fixed, the gravitating centre being somewhat eccentric. The downward pressure of the shaft presses upon the inner spur wheel, whose teeth press on those of the outer wheel and carry the wheel round. The toothed periphery of the outer wheel is connected to a train of gearing to actuate machinery.

[Printed, 4*d*. No Drawings.]

A.D. 1856, July 31.—N° 1807. (* *)

TORASSA, CONSTANTINE JOHN BAPTIST.—" Improvements " in obtaining motive power by the aid of explosive gases."

A mixture of hydrogen gas and air is admitted alternately on opposite sides of the piston of a cylinder and piston arrangement similar to that of an ordinary steam engine, and is exploded at the proper time by a spark, or red-hot platinum wire " obtained by a " galvanic battery;" motion is thus produced. The hydrogen may be obtained from the decomposition of water, either by means of a galvanic battery, or by passing steam through a red-hot tube containing iron scraps. This part of the invention is intended as a substitute for steam power.

" The above-described power of exploding gases " may be applied " to every description of steam engine."

The first method is by " removing the boiler, the furnace, and " the chimney," and making the requisite alternations, " par- " ticularly in the cylinder," so " as to make it answer for using " explosive gases instead of steam."

The second method consists " in removing only the furnace and " chimney and the water from the boiler," and forcing air into the boiler by the explosion of gases according to the method above set forth; the air, thus compressed, works the engine instead of

steam. To increase the pressure, the air in the boiler may be heated.

[Printed, 10*d*. Drawings.]

A.D. 1856, August 9.—N° 1880.

MARCH, CHAPMAN.—This consists in propelling vessels by the agency of a horizontal wind wheel placed on the deck, and attached to a vertical shaft connected by gearing with the screw propeller. The wheel overhangs the deck on each side. The vanes are inclined or curved, and may be fixed, or moveable so as to open out on the acting wind, and close on the other side, or a shifting wind cover may be used. The wheel may be also used for hoisting sails and effecting other arduous operations.

[Printed, 6*d*. Drawing.]

A.D. 1856, August 15.—N° 1910.

DE KIS-GERESD, STEPHEN SZABÓ.—(*Provisional protection only*.)—Motive power is obtained from a wheel or cylinder partly or altogether immersed in a heavy fluid, and having a number of holes or borings parallel to the axis, in which are moveable bars or plugs exactly fitting them. The surface of the bar at the uppermost part of the cylinder is level with its surface, but in subsequent positions the bar recedes till a quarter of a revolution has been made, and thus allows liquid to enter. Afterwards the bar again advances, so that at the lowest point its surface is again level with that of the cylinder, and afterwards projects beyond. After three quarters of a revolution the bar begins again to recede. The rotation of the cylinder is thus produced. The directions of the holes and fingers may be radial, and holes and projecting fingers are not both necessary.

[Printed, 6*d*. Drawing.]

A.D. 1856, August 16.—N° 1921. (* *)

JOYEUX, LOUIS AUGUSTE.—Obtaining motive power by a mixture of steam and air; one part of steam to five of air; the steam being introduced at the pressure of six atmospheres.

"This invention comprises three apparata; the generator, the "engine, and the regenerator." The generator is composed of a furnace built of fire-brick, and of an ordinary cylindrical steam boiler, and a series of six cylindrical tubes or worms independent

of each other, which heat the mixture of air and gas producing the motive power. The engine consists of an ordinary engine receiving the "motive gases" and actuating a blowing apparatus which injects the air into the "tubes placed in the furnace." "The regenerator is formed of a metallic cylindrical chimney, and "ascending screw-like passages or flues to the top, through which "the air passes and enters the blowing apparatus to feed the hot "air apparatus." "On the exterior of those pipes the gaseous "mixture circulates which has acted upon the piston. The con-"densed water of the mixture which escapes is returned into "the boiler, and the recooled air spreads itself outside the fur-"nace chimney, and through the centre of the regenerator, to "heat still more the air entering by the suction of the blowing "apparatus."

[Printed, 10*d*. Drawing.]

A.D. 1856, August 30.—N° 2017.

HERBELOT, Armand Louis André—(*Provisional protection only.*)—Motive power is produced by introducing gas or fluid into an air-tight case containing a shaft having one or more helices or threads of uniform breadth.

"The gas or fluid by exerting unbalanced pressures on abut-"ments formed either at the extremities of the helix or helices, "or otherwise communicates rotatory motion to the aforesaid "shaft or spindle, and by means of it to an external shaft."

[Printed, 4*d*. No Drawings.]

A.D. 1856, September 17.—N° 2179. (* *)

SCHRÖDER, Carl Heinrich.—"An improved rotatory engine "to be worked by steam or other elastic fluid, which invention "is also applicable as a rotatory pump for raising and forcing "fluids."

"The principal feature of novelty in this invention consists "in placing the working cylinder or steam space (in which the "piston and shaft revolve) with its axis at an angle of more or "less inclination to the axis of the engine shaft, instead of their "axes being coincident or parallel, as is usually the case, the said "steam space being divided into two equal parts in a diagonal "direction by means of a circular division plate or diaphragm "placed at right angles to the axis of the shaft, and provided

" with an opening through which a solid piston (fitting the steam " space) works." This novel principle of construction may be carried into effect in a variety of ways.

The cylinder may be stationary, and placed with its axis at an angle of inclination to that of the shaft, with the diaphragm fixed to and revolving with it. Or the cylinder and diaphragm may be both stationary, or the whole of the engine and cylinder may revolve together. A drawing of the second modification of this invention is described arranged as a rotatory engine to be driven by steam; also a method of reversing the engine and converting it into a rotatory lift or force pump.

[Printed, 8*d*. Drawing.]

A.D. 1856, October 1.—N° 2302. (* *)

JONES, David.—(*Provisional protection only.*)—" Obtaining " motive power by the combined action of air, water, or other " fluids on each other."

" An important feature in this invention consists in so con- " structing and operating with the apparatus that there is no " appreciable friction of the principal parts thereof, and conse- " quently no wear of the material of which they are made, thereby " effecting economy in the expense of the apparatus; the power " generated and maintained in the apparatus for an indefinite " period is also maintained at no expense."

The machine consists of two vessels, one open the other cylindrical and closed at one end being placed upright in the former, and both being filled with water. A hollow sphere filled with air is put in communication with these vessels. The upright cylinder can be made to move up and down by the water in it being successively displaced by air, and by the hollow sphere alternately expanding and contracting; the cocks which admit and emit the air and water are actuated by the motion of the machine itself.

[Printed, 4*d*. No Drawings.]

A.D. 1856, October 6.—N° 2332. (* *)

SILVESTER, John.—(*Provisional protection only.*)—" A novel " mode of applying steam or air on one end of the piston of steam " or air engines, while a vacuum is simultaneously being formed " on the other end," for which purpose an extra slide valve o

peculiar construction is used. "The improved slide valve is placed "under the present ordinary slide valve, and is so constructed, "that while the piston is at work, the valve, by cutting off the "air, allows a vacuum on the end of the piston opposite to that "making the forward stroke, or vice versâ. It is requisite also, "to have at least one air valve at each end of the cylinder, to "allow the requisite escape to maintain the vacuum."

[Printed, 4*d*. No Drawings.]

A.D. 1856, October 11.—Nº 2388. (* *)

NEWTON, Alfred Vincent.—(*A communication.*)—"A new "gaseous liquid, to be used in generating motive power."

"This liquid may consist of 'one part of coal tar, three parts of "oil, and eight parts of bisulphuret of carbon,' to which is "added sufficient cold oil of vitriol, or hypochlorous acid, to de- "compose the bisulphuret of carbon into liquid carbonic acid. "This compound (which is to be kept in a tight vessel) is what "the inventor denominates 'sulphoil carbonic acid.' Another "vessel containing carbonic acid gas [at about 36 atmospheres], "and the vessel containing the sulphoil carbonic acid, are then "connected together, and the carbonic acid gas thoroughly im- "pregnates the sulphoil carbonic acid liquid, and forms a gaseous "liquid, which represents the totality of the motive power, and "is then ready for use, being about in the proportion of three "of the liquid to one hundred of the carbonic acid gas in com- "bination."

"To apply this medium or agent to propel machinery, a copper "worm should be used, one end of which is connected with the "vessel containing the sulphoil carbonic acid, and the other with "the cylinder of the engine, serving as the supply pipe, which, "together with the cylinder, is submerged in an oil bath, which "is heated, in order to expand the gaseous liquid, on its passage "from the reservoir to and in the cylinder, to work the engine, "and is thence exhausted into any suitable condensing appa- "ratus, where it is immediately condensed by injecting it into the "reservoir, containing the same liquid for re-use."

"On the application of heat, the pressure will increase in the "ratio of one pound per square inch to every degree of increased "heat (Fahrenheit)."

[Printed, 4*d*. No Drawings.]

A.D. 1856, October 17.—N° 2420.

COMMANDEUR, Joseph. — (*Provisional protection only.*)— " This invention consists of two upright cylinders formed of " helical spires, between which heavy iron balls run, and cause " by their weight the cylinder to oscilate on its pivot or axis. " There are as many balls as spires of the helic or Archimedes " screw."

[Printed, 6*d*. Drawing.]

A.D. 1856, October 17.—N° 2421. (* *)

FOGGI, Ferdinando.—" Improvements in the manufacture of " engines driven by steam or other vapour."

"This invention effects the conversion of the reciprocating " motion of a piston, or plunger wrought by steam, within a " cylinder (whether such motion be rectilinear or otherwise) into " a continuous rectilinear or rotary motion, and without the use " of cranks, upon the principle of action and re-action, by adapt- " ing to the cylinder, and to the rod of the piston working therein, " palls or catches acting against racks or ratchets, so that the " cylinder and rod shall impart a progressive action to each other " and which is maintained by the racks being either formed upon, " or fixed to the machine to be put in motion;" or else serving as the resistance against which the power of the cylinder is to be exerted to give a continuous motion to itself.

The inventor describes a modification of the foregoing, and adaptations of the engine to be used as a motive power generally, and to locomotives, common road carriages, ships and floating vessels.

[Printed, 8*d*. Drawing.]

A.D. 1856, October 20.—N° 2455.

BARROW Robert George.—A self-sustaining motive power is derived from a double-acting force pump, attached to which is a receiver. Water or air is forced into the receiver until the required pressure is obtained. The pump is then connected to the engine. A supply pump leads to the cylinder in which is a piston, which, however, is made only to oscillate or rotate. This is effected by means of a central box or ring, with bearings that carry a shaft on which a main lever or beam is placed so as to

move on a universal centre. Toothed wheels, bands, and chains, and internal or semi-internal sun and planet wheels or segments of wheels receive the force or power derived from the piston, and transmit it, to the opposite end of the main lever from the cylinder. The main lever is, by these, caused to move in the opposite direction of the force

[Printed, 1*s*. Drawings.]

A.D. 1856, November 11.—N° 2652.

LEADBETTER, James.—(*Provisional protection only.*)—To obtain motive power the inventor uses a wheel fixed in a vertical, horizontal, or other position, on the shaft of which are loosely fixed a series of jointed levers, whose outer arms are fixed by screws to a series of bow springs on crossed levers, bearing down against each of the outer ends of the jointed levers. A series of pins fixed on the arm of the wheel run in short slots in the outer levers to prevent the levers from assuming a straight position, and also to cause the motion of the wheel to be reversed, by which means the levers will tend to verge into a straight position, and cause the wheel to travel round.

[Printed, 4*d*. No Drawings.]

A.D. 1856, November 28.—N° 2816.

TISSOT, Camille Auguste.—Motive power is obtained from the vapour of the substance produced by adding one part of fatty oil, and thirty parts of ether to water slightly alkaline. The generator or boiler is traversed by a number of tubes filled with hot water. The vapour passes from the cylinder to a reservoir and thence into a condenser, and falls in a liquid state into the cistern from which the feed pumps take their supply. The hot water is conducted into the casing of the cylinder to prevent the rapid condensation of the motive vapour. A composition of talc one third, and lubricating oil, two thirds is used to lubricate the engine.

[Printed, 10*d*. Drawing.]

A.D. 1856, December 1.—N° 2843.

PEABODY, Francis.—This is an improvement on his former invention, No. 692, A.D. 1855. The regulating disc is made of

" hinged portions in gates, which may be folded back to allow " the air to pass freely in light breezes." The wind wheel is drawn away from these gates by a series of weights which are successively lifted when the force of the wind becomes great. Instead of using a turntable the whole mill is made to rotate by rollers running on a rail, or in fixed buildings two wind wheels and gates are placed at the opposite ends of the buildings, and " each wheel with the parts immediately connected therewith is " secured to a" moveable "platform," "whereby each wheel is " enabled to traverse an arc of 180 degrees."

[Printed, 1*s*. 2*d*. Drawings.]

1857.

A.D. 1857, January 2.—N° 21.

GRAS, AUGUSTIN.—(*Provisional protection only.*)—" Obtaining " motive power" " by means of a steam engine forcing air by a " suitable air pump into a reservoir" " connected with a worm or " coil of tubes placed in the furnace of the steam engine boiler. " The air is admitted to the coil by means of a suitable cock or " valve. It becomes heated and highly elastic in the coil, whence " it passes into an air engine."

[Printed, 4*d*. No Drawings.]

A.D. 1857, January 2.—N° 25.

HARRIS, JAMES.—In this invention air is compressed by means of pumps worked by steam engines or any prime mover, and forced through tubes to serve as a source of motive power to an engine at a distance. It is proposed to transmit power in this way to mines, shafts, and underground workings, and also to the " houses of operatives." The air instead of being compressed may be exhausted, and thus work atmospheric engines.

[Printed, 4*d*. No Drawings.]

A.D, 1857, January 22.—N° 196. (* *)

LUEDEKE, ERNST.—(*Provisional protection only.*)—Improvements in obtaining power.

The steam or "gas (obtained in a suitable vessel from zinc " acid, and water, and other materials as is well understood) or " air (in passing from a generator) enters the regulating appa- " ratus, and then enters and works the engine, which may be a " rotatory or reciprocating engine. The regulating apparatus is " composed of a vessel or enlargement of the steam gas or air " supply pipe, in which it acts on a piston in a suitable cylinder." The piston rod is by suitable apparatus put in communication with a throttle or other valve in the steam, gas, or air supply pipe, so that when the pressure of the steam, gas, or air increases it will by acting on the piston also act to move the throttle or other valve; and it may also be arranged to act on the damper of the boiler flue by thus acting on the throttle valve; the extent of the opening leading to the engine will be reduced when the pressure and supply increase, and thus will the steam, gas, or air to the engine be regulated by its own pressure.

[Printed, 4*d*. No Drawings.]

A.D. 1857, February 17.—N° 465. (* *)

PASCAL, Jean Baptiste. — "Improved engine with rotary " piston."

The rotary cylinder is placed eccentrically to the enclosing cylinder or shell. Sliding plates or pallets are arranged round the periphery of the inner or eccentric cylinder, and slide into or out of radial recesses made in the inner cylinder, and extending its whole length, and rest at the bottom of their guiding recesses on elastic packings of hemp, silk, metal, asbestos, india-rubber, " or springs. The rotary cylinder is constructed in two parts, " and in the space between are introduced large movable pal- " lets, which act as pistons and propel the engine, and are separated in the middle by an elastic packing. The six other radial " leaves project a little beyond the periphery of the cylinder, and in the revolution of the cylinder one of them is always in contact with the surface of the moving cylinder, and acts as a packing, and also to prevent the shock which takes place between the piston pallets and the steam abutment. The induction and eduction orifices are at opposite points in the diameter. The motive shaft bears on roller bearings to change the sliding into a rolling friction; the rollers are in one piece with their axis

and turn in the body of the bearing, which forms a reservoir for oil to lubricate the axes.

A method of packing the joints is described.

[Printed, 10*d.* Drawings.]

A.D. 1857, March 7.—N° 669.

TABOURIN, GEORGES ANTOINE.—(*Provisional protection only.*) —"An improved rotative engine," which runs in a closed circular chamber or vessel under the constant pressure of some elastic fluid which does not escape after its action; atmospheric air compressed to 3, 4, or 5 atmospheres in a separate vessel is conveyed through a pipe and sliding valve into an empty space over the circular chamber. A wheel composed of separate cells is keyed on a shaft. The motive fluid has to pass through the apertures of a thick grate to which the mouths correspond, and the wheel is driven by the pressure exerted on the sides of the cells opposed to them.

[Printed, 6*d.* Drawing.]

A.D. 1857, March 23.—N° 814. (* *)

SMITH, JOHN.—Aëriform fluid expansion engine.

This invention consists in the use of an expansion chamber in conjunction with every two cylinders in a series of cylinders, so that the steam in passing from one cylinder to another, shall pass through and be accumulated to a certain extent in the expansion chamber.

In the drawing of an engine on this construction "two cylin-" ders are represented with their valves and pistons, and two " expansion chambers with their appendages. The first cylinder " receives steam from a common boiler instead of exhausting " into the atmosphere, or into a condenser; the vapour flows " into a receiver. This first receiver as well as the second re-" ceiver is partially filled with water, and placed in contact with " the heated air passing from the boiler through the flue. The " steam from the first receiver is conducted through a pipe to " the second cylinder, which is of larger capacity than the first " cylinder. The exhaust steam from the second cylinder pro-" ceeds to the second receiver, and this second receiver supplies " steam to a third cylinder, and so on, increasing the size of the

"expansion vessels whatever be the number of cylinders and "receivers contained in a series, until the steam be finally "exhausted into the atmosphere or into a condenser."

[Printed, 8*d*. Drawing.]

A.D. 1857, March 27.—N° 857.

HOCHSTETTER, Edouard.—(*Partly a communication from Augustus Seyferth.*)—(*Provisional protection only.*)—This "consists in the employment of the vapor of the sulphuret of carbon "as a motive agent."

"We prefer to obtain the vapours in a generator, the whole "surface of which should be covered with water."

[Printed, 4*d*. No Drawings.]

A D. 1857, April 4.—N° 935.

BOURNE, John.—Power is obtained from the products of combustion of coal dust, or liquid fuel drawn or injected into a closed combustion chamber heated very hot. The products may be used to move machines resembling a Barker's mill, smoke jack, or turbine, which may be immersed in liquid or not, or may be used to propel vessels by escaping through orifices in any suitable position. The orifices may be given a circular or other motion so as to cause the escaping fluid to act every moment in a different line or circle, or may be made with a trumpet mouth. The dust may be introduced into the combustion chamber with the air by a fan, or by a wheel or circular valve revolving continuously with pouches filled with coal dust as the buckets of a water wheel are with water.

[Printed, 4*d*. No Drawings.]

A.D. 1857, April 18.—N° 1103. (* *)

ORMAND, Charles Benjamin.—This invention relates to motive power engines operated either by heated air, steam, or gas, expanded by high degrees of heat; the improvements are chiefly applicable to those engines into which successive volumes of heated fluid are admitted, mixed or unmixed with steam, to operate the pistons of such engines by their expansive force, such fluids being drawn and compressed by pumps. In order to employ

without inconvenience fluids heated to high temperatures even by direct contact with burning fuel, the engine cylinder is increased to about three times the length of the stroke; this additional length is occupied by a drum attached to each side of the piston; these drums fit easily into the cylinder without rubbing, excepting on two annular projections situated just beyond the movements of the piston; the ends of the drums and the ends of the cylinder, both of which are exposed to the hot gases, are protected from the extreme heat by fire clay, and the ends of the cylinder are surrounded by space for the same purpose, wherein water is kept in a boiling state by the heat which passes through the metal, whilst the central part of the cylinder wherein the piston operates between the projections is kept comparatively cool by the steam which is generated, and which, through suitable pipes, finds its way into the cylinder on each side the piston, and is constantly issuing towards the cylinder ends between the projections and the surface of the drums, and so tending to reduce the temperature of those parts. The piston rod stuffing box is disposed at the end of a long neck cast to the cylinder end. The valves and rods are hollow as well as the walls of the valve box, so that through them there is a constant circulation of water in connection with the water spaces round the ends of the cylinder. The furnace is enclosed in a cylindrical iron casing of adequate strength, if necessary made double to form surrounding water space; it is lined with fire brick or clay, and the steam generated therein may or may not be allowed to commingle with the heated air; sometimes water is introduced into the furnace and a rotating agitator used to disseminate the steam; the fuel is spread over the sole of the furnace, and the compressed air is admitted through pipes at the sides in order that the comminuted fuel may not rise and be carried off in the draught; those particles which do obtain motion are deposited in a chamber formed beyond the bridge, or checked by a screen or veil of wire gauze, platinum, or asbestos cloth interposed between the furnace and the engine. An apparatus called a heat transmitter is provided for imparting the heat contained in the exhaust fluids to the current of compressed air. Modifications of the parts comprising the invention are fully described. The applications extend to engines worked by steam highly surcharged with heat.

[Printed, 2*s*. Drawings.]

A.D. 1857, April 20.—N° 1108.

BARLOW, Charles.—(*A communication from Joseph Commandeur.*)—(*Complete Specification but no Letters Patent.*)—Apparatus for regenerating the impulsive force of any motive power.

This consists of two cylinders having helical spiral troughs, along which heavy iron balls travel and give an oscillating rotatory motion to the cylinders whose axes generate conical surfaces of revolution. The upper parts of the shafts are attached to cranks while the lower work in suitable bearings. The spirals of the cylinders have a reverse action, the one (represented in the drawing as of less diameter) serving as the motive power, and the other to carry up the balls running out from the spiral of the first.

Bucket wheels may be substituted for either cylinders, or both may be used to feed such a wheel.

[Printed, 8*d*. Drawing.]

A.D. 1857, May 21.—N° 1436.

BEECH, William.—(*Provisional protection only.*)—" Improve-" ments in generating and applying motive power."

A piston working in a cylinder is acted on by an exhauster producing a vacuum in one side and by the atmospheric pressure or the pressure of confined and rarified air on the other side. Two pistons may be employed to work upon a through rod within the same cylinder which is made with an air-tight division dividing its length into two parts. The rod passes through this division.

[Printed, 4*d*. No Drawing.]

A.D. 1857, May 23.—N° 1460.

DE LA BARRE, Gautier Olivier. — (*A communication.*) — Motive power is derived from the action of wind on pieces of wood or metal which may be upright or flat or curved in a spiral direction from top to bottom, and which are fixed to a vertical shaft, the whole being placed within a pavillion with moveable sliding blinds or shutters of wood or metal. These are raised or lowered according to the velocity of the wind by means of a moderator placed on the top of the pavillion which the wind causes to rotate more or less on its axis and thereby wind or

unwind cords or chains which act on the blinds or shutters. A collapsible vessel used for a pump is also described.

[Printed, 10*d*. Drawing.]

A.D. 1857, June 12.—N° 1655. (* *)

BARSANTI, Eugène, and MATTEUCCI, Felix.—This invention is entitled "Improved apparatus for obtaining motive "power from gases;" it "relates to the means of obtaining motive "power from the explosive force of a mixture of atmospheric air "and hydrogen, or any other inflammable gas. The explosion of "the mixed gases is effected by means of an electric spark applied "to the under part of a piston working in a cylinder."

According to the first method of carrying out this invention, only "the vacuum produced underneath the piston by the "explosion" is made available; in this case, therefore, "it is "simply atmospheric pressure acting upon the outer surface of "the working piston, which communicates the requisite motion "thereto in one direction, the return stroke being effected by the "piston rod." In this arrangement, besides the main piston, there is a smaller "counter piston," whose office "is to draw in "the charge of gas which is to be exploded, and also to clear" a small chamber (at the bottom of the main cylinder and of the same diameter) of the products of combustion. In this engine the main piston only exerts its power on the fly-wheel shaft during its descent by the pressure of the atmosphere as it acts on the said fly-wheel shaft through the intervention of a rack (fixed to the piston rod), spur, and ratchet-wheel gear, which does not act during the rising of the piston by the "explosive force." The gas and air are admitted by a slide valve connected to the fly-wheel shaft by means of a cross-head, rods, and excentrics. The charge is fired by an "electric spark" from "a small cylindrical circuit "breaker," which rubs against a steel spring; this circuit breaker is kept in continual rotation by a band and pulleys in connection with the fly-wheel shaft. The electric circuit is only completed when the slide valve is at the extremity of its travel. "A Bunsen's "battery" and "De la Rive's multiplier" furnish the electric power. Two cylinders, operating alternately, are employed when this method is adopted.

"According to the second arrangement the force of the explosion "and the vacuum produced are both utilized, the one force being

" made to act on one side of the piston, and the other force on
" the opposite side. In this case the pistons and their cylinders
" differ but slightly from those ordinarily employed in steam
" engines as regards their construction and the mode of operating
" them."

Locomotive engines on this principle consist of four cylinders
" one on each of two pairs of driving wheels, the main shafts
" being made to drive these wheels by means of connecting rods,
" or gearing combined in such a manner as to change the direction
" of rotation by means of clutches." The locomotive carries a
" reservoir " of gas, between which and the feed pipe is a regulating apparatus, consisting of a small gasometer, and of a cylinder, piston, and slide valve; this arrangement supplies the gas to the working cylinders at an uniform pressure.

When the direct action of the explosion is used as a percussive force, the extremity of the piston rod is applied to the work; in this case the rotating shaft of the engine merely works "the supply
" of the mixed gases to the cylinder, and the discharge therefrom
" of the products of combustion."

[Printed, 1*s*. Drawings.]

A.D. 1857, June 13.—N° 1662.

MARCH, CHAPMAN.—(*Letters Patent void for want of Final Specification.*)—The invention "is based upon the theory that
" the sun is the grand central power of repulsion and attraction
" of the universe, possessing alternated drifts or lines of repulsive
" and attractive movement, which lines act upon the earth in
" such manner as to cause the revolution of the latter. The
" special apparatus by means of which this power is taken ad-
" vantage of consists of a vertical first motion shaft carrying a
" horizontal wheel round the periphery of which are disposed
" a set of thirty-two natural magnets interpolated with corre-
" sponding pieces of steel, the whole series being dovetailed with
" each other to form a complete ring, the whole being held down
" by a ring of copper plates."

The arrangement is particularly useful in conjunction with the inventor's former invention (No. 1880, A.D. 1856). In this case the magnetic wheel is disposed upon the wind wheel, a layer of caoutchouc being interposed between the two.

[Printed, 4*d*. No Drawings.]

A.D. 1857, June 23.—N° 1754. (* *)

ROUSSELOT, Joseph Scipion.—"An improved method of "obtaining motive power, and engine for apply the same."

"An oxyhydrogen flame," the gases for which are generated from water by a magneto-electric machine, is made to heat air; the expansion of the air gives "motion to pistons, and thence "through rods, cranks, etc., to any apparatus and for any purpose "required."

The magneto-electro machine employed has its horse-shoe permanent magnets bolted "in a vertical position" on to a horizontal platform; the polar faces of the said magnets are thus enabled to be in the same plane, and arranged in the circumference of a circle, with the line joining the contrary poles of the same magnet radiating from the centre of the said circle. The armatures are arranged in an exactly similar manner to the permanent magnets, with the polar faces of their cores opposite to the polar faces of the magnets, but are fixed to a ring which is mounted on a vertical shaft carrying a commutator, by which the various induced electric currents are made available. From the commutator conducting wires are led to a voltameter, in which the mixed gases are generated.

The general arrangement of the engine consists of "gasometers" attached to the voltameter, a "dilating vessel" in which the expansion of the air takes place, a "distributing box" to admit the dilated air to the "motive cylinder," and the "motive cylinder" itself, containing pistons which transmit the power of the engine to the machinery to be driven.

The action of the engine is as follows:—Before starting the engine, a "compressed air reservoir" and "the oxyhydrogen "reservoirs" are filled. After being expanded in the "dilating "vessel," the air passes to the "distributing box," thence into one of the "motive cylinders," producing motion of its piston; at the return stroke of the piston, the exhausted air is forced into a supply cylinder, "whence it is returned to the dilating vessel. "A little air is supplied by a small pump, to compensate for the "waste which may occur in the working of the engine." When the engine has been started in the manner just described, it drives the magneto-electric machine, and "proceeds without the "aid of the supplementary arrangements which are required to "start it."

Electricity is also employed to light the gas in the "dilating "vessel," which it does by "an electric spark" passing between "platinum wire points" "in front of a gas jet." In "the "distributing box" "an increase of dilatation" is given "to the "air by the action within it of a series of electric sparks, which "are made to pass between two copper rods terminated by "platinum points, from a battery or from the magneto-electric "machine."

A peculiarly-constructed valve closes "each of the several "openings" into the "motive cylinder."

To avoid explosions, the pipes connecting the "gasometers" with the "dilating vessel" are furnished with "wire gauze par-"titions," and "with a small cylinder filled with sand, through "which the gas can but the flame cannot pass."

[Printed 10*d*. Drawings.]

A.D. 1857, June 23.—N° 1756.

NEWTON, WILLIAM EDWARD.—(*A communication from William Montgomery Storm.*)—(*Provisional protection only.*)—Motive power is derived from an elastic vapor obtained by the action of heat on water or other liquids in a highly subdivided state, in suspension in an elastic medium, which is itself expanded by the heat.

The liquid in suspension is heated in a vessel called the flasher by steam or water heated under a pressure of steam without the flasher being directly exposed to the fire or products of combustion. There should be a difference of about 30° Fahr. between the steam within, and that without the flasher. If water be used as the suspended liquid, the pressure within the flasher should be less than that in the boiler, but if more volatile liquids, as naphtha, are used, this is not necessary. The vehicle may be steam or air, but it is best to use a gaseous body permanent at ordinary atmospheric temperatures, and over which water has a self-acting power of condensation ; carbonic acid, or better ammonia, are the best suited. The ammonia and water after acting on the piston are cooled and re-combined in the form of gas-charged water. Cylinders with absorbing wicks draw up the fluid into the injecting pump. The stuffing boxes have spaces between gaskets connected with the cold receiver to absorb any gas that may pass through the stuffing box.

[Printed, 4*d*. No Drawings.]

A.D. 1857. July 11.—N° 1938.

LAMY, HIPPOLYTE.—Engines based on human organization and presenting all the phenomena of a regular circulation.

They may be actuated by steam, gas, or heated air, and consist of two cylinders. Four modifications are described, according as the engine works at full pressure, or is expansive, and according as it is, or is not provided with metallic gauze for resumption of the caloric. In the first modification the escape of steam from the slide valves of the second cylinder is suppressed, and clack valves are fitted on the lower bottoms. Between the cylinders the steam passes through a refrigeratory apparatus containing water kept at 100°. This water may be used to vaporize ether or chloroform or other liquid. The expansion of steam may also be used for working another engine, the piston rods of which are an extension of those of the principal engine. From the second cylinder the steam or air proceeds to the re-heating cylinder.

[Printed, 10*d*. Drawing.]

A.D. 1857, July 11.—N° 1939.

DÉPINAY-PRÉHAMON, ALEXANDRE AMAND NOËL.—(*Provisional protection only*.)—"Improvements in windmills."

"The improved mill consists of a wheel or drum mounted on " a vertical axis, and having a number of blades or levers on " which the wind takes effect. It is enclosed within a case having " a movement concentric with the axis of the wheel," and "fur- " nished with two air passages, one for the inlet of air or wind," which is "funnel shaped," and "kept in the eye of the wind by a " vane or other apparatus." "The other for the escape."

[Printed, 4*d*. No Drawings.]

A.D. 1857, July 27.—No. 2040.

BROOMAN, RICHARD ARCHIBALD.—(*A communication from P. and L. Larochette.*)—Motive power engines to be worked by steam, air, or water, consisting of a series of tubes or cylinders, in each of which is placed a vane or set of vanes or other contrivance for receiving motion from a fluid in motion. These tubes are combined so that the fluid passes successively through the *whole of them* impressing a rotary motion upon each of their

central shafts, or upon one common shaft, from which the motion is transferred to the driving shaft.

[Printed, 6d. Drawing.]

A.D, 1857, July 30.—N° 2076.

IVORY, THOMAS.—Rotary and reciprocating engines.

The fluid or aeriform body is used to cause a recoil of one or more bent arms. It enters at the centre of motion, and is allowed to impinge at the outer end against a fixed ring or solid abuttal opposite and close to the orifice of the arm, and then escapes through an orifice on the side nearest the centre. Another set of arms is used to reverse the rotary motion, or to produce reciprocating motion. A tail or continuation of the arm in which the steam may expand and escape more gradually may be added. The recoil principle may be combined with that of Barker's mill, or that of impulses upon vanes.

[Printed, 10d. Drawing.]

A.D. 1857, July 31.—N° 2090. (* *)

BEALE, JOHN.—Improved construction of rotary engine.

In this arrangement of the parts of the engine the shell is made cylindrical and stationary, and set excentric to the revolving axle; through this a slot or perforation is cut, to allow a single slide or piston to move freely backwards and forward within it as the axle rotates. Both ends of the rotary piston work alternately against the concave periphery of the cylinder during a part of the revolution, and the touching surfaces form a line in steam-tight sliding contact that acts as a constantly moving lineal division between the vacuous space on one face of the piston and the steam on the other face. The piston has "guide pieces" on its ends, which project into "guides" made in the end plates for their reception; and the edges of the guides are packed, and bear closely against the edges of the recesses in which they run. The engine may be packed endways by adjustable end plates. The machine has a reversing slide.

[Printed, 8d. Drawing.]

A.D. 1857, August 6.—N° 2125.

GILMOUR, WILLIAM.—(*Provisional protection only.*)—Continuously acting motive power obtained from weights acting on combinations of levers.

One of the simplest modifications consists of a pair of weighted parallel levers, each set on a fulcrum near one end, while to the other end is attached a weight. The shorter end is connected to a crank or axis having a longer crank at the opposite end. To the longer crank is attached one end of an equal armed lever, whose other end is attached to a transverse shaft with four cranks. The second crank is linked to the longer arm of another lever, to which is hung a weighted lever one half that of the weight on the main lever. The shorter end of this lever is linked to a crank on a secondary horizontal transverse shaft having four cranks, the external one next to that last referred to being linked to the weighted end of the main horizontal lever. The remaining two cranks on the main four central shafts operate on a corresponding series of parts in connection with the other main horizontal weighted levers, so that there are two main weighted levers, which as they descend alternately elevate the two lighter weights. And these lighter weights in turn descending raise the main weighted levers, and cause the main horizontal crank shaft to revolve continuously.

[Printed, 4*d*. No Drawings.]

A.D. 1857, September 17.—N° 2408.

LUEDEKE, JOHAN ERNST FRIDRICH.—(*Provisional protection only.*) — A new motive power engine which consists of three parts.

In the first hydrogen is generated by the action of zinc or dilute sulphuric acid. The hydrogen gas is transmitted to the second part, mixed with a suitable quantity of atmospheric air, and exploded. After the explosion a partial vacuum is "pro-" duced, which is made to produce an exhaustion in the 3rd " compartment, against which atmospheric pressure is to act."

[Printed, 4*d*. No Drawings.]

A.D. 1857, September 19.—N° 2436. (* *)

CAVALERIE, FRANÇOIS.—(*Provisional protection only.*)—Improvement in motive-power engines."

The power is increased by an " arrangement of wheels worked " by connection rods. The piston connecting rod is jointed to a " vertical wheel, working on a railway, and thereby receives an " *alternate* to-or-fro motion, which it communicates to a second

" larger wheel underneath it, by means of a connecting rod fixed
" to the circumference of the two wheels. The second wheel is
" mounted on an axle, turning in bearings formed on the fram-
" ing, and transmits this motion by a rod adapted to its circum-
" ference, to a fly wheel fixed on an axle, having an excentric for
" working a crank or the slide valve of the engine."

[Printed, 4*d*. No Drawings.]

A.D. 1857, September 24.—N° 2471.

LAUGÈRE, Augustin Vrain Adrien. — Horizontal windmills.

To the upper part of a vertical shaft are fixed two or more wings formed of two horizontal girders kept apart by vertical cross stays. Part of each wing round the shaft is left open for the wind to pass through freely, the remainder is divided in partitions by vanes turning in hinges. Each vane consists of a frame over which is spread oiled cloth on any light material. To prevent the vanes turning further than required, stops are fixed at right angles to the girders, the stops of each girder are held together by a cross bar. The position of the vanes may be altered so as to be more or less acted on by the wind, by means of two vertical rods moved by handles, which cause to turn vertical stay rods with small projecting arms, which latter, on pressing against the vanes cause them to shift their position. The mills are furnished with a "regulator" by which the shaft is prevented from moving too rapidly by the resistance offered to revolving vanes whose obliquity is increased or decreased according to the velocity of the motion.

[Printed, 8*d*. Drawing.]

A.D. 1857, October 3.—N° 2540.

SEYFERTH, Augustus.—(*Provisional protection only.*)—" Em-
" ployment of sulphuret of carbon for motive purposes."

The sulphuret is vaporised in a vessel surrounded with water or with steam, and after performing its work in the cylinder is led into a condenser formed of cotton or other suitable textile material held between plates in a vessel of water and water trickles over the cotton. The sulphuret after being condensed is drawn off in a liquid to again enter the boiler.

[Printed, 4*d*. No Drawings.]

A.D. 1857, October 12.—N° 2609.

CALVERT, WILLIAM.—Obtaining motive power by the action of the wind applicable to driving of machinery on land or water.

A central vertical shaft is mounted in suitable bearings and revolves freely therein. A framing is attached to the shaft and consists of two or more pairs of radial spars braced together, which at their extremity each carry a yard to which a chain wheel is attached. The wheels are made twice the circumferential measure of a barrel on the shaft. An endless chain goes from each wheel to the barrel. The yards carry sails which taper upwards to their point of suspension on the central shaft and receive an independent rotary motion while the framing rotates by means of the endless chains and they are thus kept in the most favorable position for catching or feathering the wind. By rotating the chain barrel the sails may be inverted to reverse the direction of their motion or made to counteract each other which is useful for facilitating their reefing. By tapering the sails and mounting them on yards which stand at an angle to a horizontal line, their strain is thrown on the central mast, and they are prevented from acting with the leverage found in previously patented plans.

[Printed, 10*d*. Drawing.]

A.D. 1857, October 12.—N° 2610.

KYISHOGLOO, PRODROMOS B.—(*Provisional protection only.*) —" Air is compressed by means of any convenient compressing " apparatus " into " a cylindrical vessel " and then acts " upon " a wheel fitted with fans," from the axle whereof motion is transmitted to any machinery required to be driven.

[Printed, 4*d*. No Drawings.]

A.D. 1857, October 17.—N° 2658. (* *)

HUMPHRYS, EDWARD. — (*Provisional protection only.*) — Vapour engine.

The improvements are on " engines worked by steam or vapour " of volatile liquids." To prevent the escape of the vapour at the stuffing boxes and joints, " and to maintain the temperature " of all the parts of the engine, the cylinders with their stuffing " boxes, valve boxes, covers, bottoms, and supply pipes, are all " *enclosed* in a steam-tight case, having stuffing boxes for the

"passage of piston rods and slides." The case being supplied with steam of higher pressure than the vapour in the engine, leakage is prevented and the temperature of the parts maintained. Where expansive engines are used, the cylinders, valves, and other parts are prevented cooling by the steam in the casing. When the pressure falls below that of the atmosphere, the leakage of air into the cylinder is prevented.

[Printed, 4*d*. No Drawings.]

A.D. 1857, October 19.—N° 2668.

CAVALERIE, MARCELIN FRANÇOIS.—(*Provisional protection only.*)—This consists of a receiver filled with compressed air by a pump and "placed in connection with an air cylinder furnished "with a piston by means of a pipe to which a stop cock is fitted. "The rod of the piston of the air cylinder is fitted to another "piston working in a cylinder containing water and having a "forked pipe fitted with stop cocks. One end of the forked "pipe communicates with the compressed air receiver provided "with a safety valve." "Upon moving the engine along the "rail by manual or horse power a crank on the axle works the "pump and thus charges the air chamber." "The stop cocks "of the forked pipe being successively opened, a pressure is "given to the air cylinder piston. The piston at the other ex-"tremity of the rod is immersed in water, and owing to the "incompressibility of the liquid acts as a fulcrum or point of "resistance."

[Printed, 4*d*. No Drawings.]

A.D. 1857, October 28.—N° 2728.

LUEDEKE, JOHAN ERNST FRIDRICH.—Motive power engine consisting of a vessel immersed in water, one of its sides being provided with a piston of flexible material. The vessel contains air which is compressed by the pressure of the water. In the Provisional Specification the vessel is made cylindrical with an axis passing outside the cistern of water. The cylinder is made to revolve through a semi-rotation by the piston being forced down when at the lowest point and the air expanding as the cylinder revolves. The other half rotation is effected by causing the piston to be pressed so as to condense the air in the case. This is done by a weight on an arm standing vertical in the first instance. In the Complete Specification the vessel is made to rise and fall in

the water with a vertical motion. It is attached to a chain having a balance weight and the alternate motion is given by the action of the piston in compressing the air within the vessel and by the vessel being put in communication when at its lowest point with a vessel of air. The moving vessel is also loaded with a small weight.

[Printed, 8*d*. Drawing.]

A.D. 1857, October 28.—N° 2734.

SLOPER, Joseph.—Obtaining power from the wind by causing the same to act on fixed or moveable vanes or sails adapted to a vertical central shaft or drum. The sails and vanes may be made adjustable on axes so as to admit of their being set at any desired angle, and are arranged so as to admit of the wind acting on them freely and forcing them round. Various methods of constructing the sails or vanes are mentioned. According to one they are extended out on one side of the shaft and folded back on the other by means of eccentric grooves in which pins or studs attached to the ends of the arms or vanes are made to move. The arms or vanes are jointed to the shaft and are supported to receive the pressure of the wind by abutments or shoulder pieces. The central axis may be a hollow cylinder or drum or constructed with metal tubes like those of a telescope. The vanes or sails may also be constructed of a series of lathes arranged as in a venetian blind or in the same manner as revolving shutters. A curved wind conductor made moveable to be set to suit the wind is adapted to one side.

[Printed, 10*d*. Drawing.]

A.D. 1857, October 31.—N° 2775.

KYISHOGLOO, Prodromos B.—Motive power is obtained from two or more vessels or cylinders filled with water and furnished with pistons worked by cranes or screws moving vertically. There are two air pumps or engines, the air passing to and fro a pipe connecting them. The pistons of the cylinders are pressed down by the action of the air pumps, and the water from them works a rotary water engine and afterwards returns to the cylinders. Air is forced into the paddle of the rotary engine by bellows which helps to drive the machine. The motion is reversed by means of a slotted quadrant having a screw threaded at the top and an arm carrying a weight and connected with a pin

carrying a lever. This apparatus may be used as reversing gear in motive power engines.

[Printed, 1s. Drawings.]

A.D. 1857, November 23.—N° 2932.

BARLOW, CHARLES.—(*A communication.*)—The general principle of the invention consists in generating steam in a boiler heated by a closed furnace furnished with compressed air and using the steam which may be superheated or not at high pressure in one engine and then after it is exhausted from such engine again superheating it before it passes into another cylinder either high pressure or condensing; and in employing with such superheated steam the gaseous products of the combustion with heated air which may be mixed with the steam or in low pressure cylinders may be employed on one side of the piston and the steam on the other (the effect of the heated air and products together with that of the vacuum produced by condensation being equal to that of the steam) or may be used in a separate engine or cylinder. The inventor also claims a method of proportioning the heating surfaces in an apparatus for generating and superheating steam to be used in conjunction with but unmixed with the heated products and air so as to control the temperature of such products and air and prevent their admission to the cylinders at a temperature high enough to destroy the oil and grease used for lubricating, and also preventing the air and products coming in contact with the superheating pipes at such a temperature as will destroy them.

[Printed, 1s. Drawings.]

A.D. 1857, November 30.—N° 2974.

MONTEL, PIERRE AMBROISE.—(*Provisional protection only.*)—Motive power is obtained from springs or blades of steel or iron supported at their extremities by wheels fixed on the axis to which rotary motion is to be communicated and also at their centre to a central wheel fixed on the same axis. The central wheel and axis is set in motion by the action of the springs. Breaks or other controlling agents are used to stop or reduce the speed.

[Printed, 4*d*. No Drawings.]

A.D. 1857, December 4.—N° 3014.

MORTON, ALEXANDER, and HOWDEN, JAMES.—Motive power.

This invention relates "to the arrangement and working of "motive power engines of various kinds, whether actuated by the "agency of steam, air, or other elastic fluid, but it principally "concerns steam engines and boilers." In duplex cylinder expansive engines, a super-exciting chamber, or a percussive impact space, is placed between the two cylinders, as well as at the induction valve for the high-pressure cylinder. Super-exciting chambers may be used with rotatory engines, and both rotatory and reciprocating engines may be worked with air on the expansive principle, using refrigerating vessels for cooling down the air to the temperature required after having performed its office. The super-exciting chamber is fitted in the flue of the furnace, so that the heated gaseous matters arising from the burning fuel pass round it on their way to the chimney, and contains rods, tubes, or wires, which derive their heat from such matters.

The other points claimed consist; in using such chambers in conjunction with engines into which successive charges of steam are admitted for the purpose of imparting additional heat to the expanding steam.

In operating crank engines by suddenly opening the steam valves, and slowly opening the exhaust valve.

In actuating the steam valves by a piston governed by the action of a slide or other valve.

In arranging the steam and exhaust valves so that the "lead" and "cut off" actions are given by the steam valve.

In using balance wheels or weights in conjunction with crank engines. These are so arranged that the percussive action of the steam when the engine is turning its centre is absorbed by the weight of the mass put in motion, which again communicates its greatest pressure to the crank-pin when about the half stroke. The steam is admitted for an instant at the beginning of each stroke, the momentum of the moving mass gradually diminishes as the crank again approaches the centre.

In the use of a differential lever and cam gearing for regulating, opening, and closing the steam valves of engines; and

In a mode of constructing boilers in which the evaporating surface is increased by internal water vessels.

[Printed, 1*s*. Drawings.]

A.D. 1857, December 11.—N° 3060. (* *)

ROBERTS, JULIUS, and BEALE, MILES.—"Improved ma- "*chinery for* obtaining and applying motive power, applicable

"chiefly to the working of ships' pumps and other mechanism "on shipboard."

A weighted pendulum is so applied to ships' pumps as to actuate them when caused to oscillate by the rolling of the vessel. The simplest form ef putting them into practice is to suspend a pendulum rod, weighted at its lower end to a ball-and-socket joint placed midway between a pair of horizontal pump cylinders. The upper end of the pendulum rod is jointed to the piston rods, which are themselves jointed to the pistons of the pump cylinders to give the requisite play to the piston rods; hence the rolling of the vessel will, through the medium of the pendulum rod, impart an alternating action to the pistons.

[Printed, 10*d*. Drawing.]

A.D. 1857, December 12.—N° 3067. (* *)

PRÉAUD, Jean Marie.—(*A communication.*)—Engine with rotary piston to be worked by air, gas, steam, &c.

This machine is composed of an annular chamber, within which is a rotating piston that fills the section exactly, and is framed on a rotating shaft. The fluid is introduced from a port at a point in the annular chamber, in which the piston moves and acts on one face of the piston, and escaping at a port on its opposite face produces a rotary motion. In the space between the two ports, the section of the annular chamber is completely closed by "a rotary separating diaphragm and abutment," which allows the motive piston to pass over it without establishing a communication between the ingress and egress apertures. The rotary abutment thus forms a permanent partition between the two apertures, which allows passage to the motive piston only. One abutment may be common to several motive pistons. One motive piston may have several rotary abutments. A distributing valve, moved by a cam, is constructed to afford all necessary "cut-off" and escape of the fluid, and a slide valve for changing the function of the parts and direction of the motion.

The description applies to a double or single engine, the opposite parts being duplicates.

The engine may be used as a lift, a force pump, a ventilator, and clay moulding machine.

[Printed, 10*d*. Drawing.]

A.D. 1857, December 14.—N° 3070.

BUNTING, Horatio.—Motive power is obtained from a large oscillating beam or balance to which is attached and nicely suspended a heavy pendulum. Connecting rods attached near the extremities of the beam transmit the motion by means of bent levers to the main axle. Motion is communicated at first by hand or other power to the machine by acting on cranks attached to the axes of wheels connected with either end of the beam, or by acting on a rod on the periphery of a wheel applied over the centre of oscillation. In the latter case weights are fixed to the extremities of the beam.

[Printed, 6*d*. Drawing.]

A.D. 1857, December 31.—N° 3199.

MIDDLESHIP, William.—(*Provisional protection only.*)—Motive power is obtained from a wheel furnished with collapsible chambers. The chambers on one side are filled with water, which, when the chambers arrive at the lowest point, is pressed out by a pressing wheel mounted in bearings below the water wheel. The emptied chamber is prevented from refilling till it arrives at the top. This is done by a button turned by a pin. The wheel may be worked under water by reversing the position of the wheels, and substituting air as the motive power.

[Printed, 4*d*. No Drawings.]

1858.

A.D. 1858, January 26.—N° 144. (* *)

HARTHAN, John, and HARTHAN, Ezra.—Obtaining motive power by a rotatory engine worked by steam or air. The machine consists of a plate, wheel, or disc, the periphery of which is formed with a series of chambers or spaces, which present somewhat the appearance of the buckets of an ordinary overshot water wheel, but in place of the buttons (or soles) of the chambers being flat, they are curved into the direction of the axle of the wheel. Jets of steam or air bear successively upon the chambers of the wheel by a jet pipe brought in close proximity to the "mouths"

or orifices of the chambers, but without actually touching them. The jet pipe is placed near one edge of the periphery of the wheel, the opposite edge having an exhaust or escape pipe near it. The steam or air is supplied from a generator with which the jet pipe is in communication. This pipe has an ordinary stop or throttle valve, by which the engine is stopped, started, and controlled, When the stop valve is opened the jet impinges on the curved bottoms of one or more of the chambers, and gives a rotary motion to the wheel, bringing the next chamber under the influence of the jet, and so on, the wheel rotating as long as the jets are in action.

[Printed, 10*d*. Drawing.]

A.D. 1858, February 10.—N° 253. (* *)

NASMYTH, JAMES.—(*Provisional protection only.*)—" Im-" provements in the mode of obtaining motive power and of " applying it."

In a moveable tube or cylinder a piston is placed, and the aperture behind it closed by a metallic plate. Between this plate and the piston, steam, compressed air, or water under pressure is introduced. A rod from the piston is in contact with an arm from a vertical shaft moving on a pivot, and the tube or cylinder is caused either to rotate, or else is made to move forward horizontally by a rod issuing from the tube or cylinder, by which motive power is obtained and applied. " I place a piston with its " rod in an exhausted tube, cylinder, or any suitable vessel; the " rod passes through the bottom, and by the pressure of the " air on the piston motive power is obtained and applied. I fix " on the tube an arm, which, as the tube turns round, comes in " contact with a projection on the vertical shaft."

[Printed, 4*d*. No Drawings.]

A.D. 1858, February 27.—N° 392.

CAVE, WILLIAM.—(*Provisional protection only.*)—Wind wheel or windmill for the propulsion of vessels, applicable to propelling carriages or driving machinery. The peculiarity consists in having the vanes or floats placed with their superficial surface parallel to the line of the axis upon which the wheel turns, which may be placed either in a vertical, horizontal, or inclined position, and if found requisite one half of the wheel may be enclosed in a case or

guard, which should be moveable so as to expose either side to the action of the wind, according as the motion may be required in one direction or the other.

[Printed, 4*d*. No Drawings.]

A.D. 1858, March 13.—N° 514.

JAMESON, John.—" Compressing and expanding aëriform " fluids."

The apparatus consists of a series of cylinders, the upper parts of which are heated by a flue from a furnace, and the lower cooled by a cold water cistern. Each cylinder is fitted with a plunger made hollow and stuffed with "charcoal or other bad conductor " of heat," but having passages for the air to pass through which are filled with "ravellings of fine wire." The plungers are all moved by cranks placed "alternately opposite to each other" on the same shaft. The lower ends of the cylinders communicate with the lower ends of the next by passages having valves permitting the air to pass only in one direction. The last cylinder communicates by a similar passage with the reservoir for compressed air. When the flue is heated a part of the air in all the cylinders in which the plunger is at the bottom will force itself into the next cylinder or into the reservoir, and the crank shaft being turned by the engine a stream of air will be directed into the reservoir whence it may be supplied to the working cylinder of the engine.

[Printed, 8*d*. Drawing.]

A.D. 1858, March 19.—N° 565. (* *)

SCOTT, George.—Generating elastic fluids.

This invention consists of an apparatus in which air or other gases at a high or low temperature are commingled with water in a finely divided state or spray, and introduced into coils, tubes, and vessels to be heated by fire. The combination of these bodies produces an elastic fluid of great expansive force, which may be employed for working steam engines. Nine quadruple coils of pipes are connected at bottom to three horizontal cylindrical chambers, and at the top to three horizontal cylindrical chambers, communicating with eight vertical cylindrical steam chambers the tops of which are connected by pipes. The lower chambers communicate by pipes with a "mixing box" containing some vertical partitions of wire gauze, through which both air and water

are forced into the mixing box by the pumps. A pipe communicating with the generator by two pipes, and containing a float attached to a rod and connected to the lever of a valve in a steam pipe, leads to a small direct acting donkey engine which works the water pump that feeds the apparatus with water; a lever worked with tappets gives motion to the slide valves or fourway cock. When the water in the generator falls the float descends raises a lever, and allows the steam to enter the donkey engine.

The generator is filled with water to such height as partially to fill the chamber, and a fire is made on the bars beneath. The coils contain only a small quantity of water, which is soon boiled and steam raised, air and water are then forced through the "mixing box," the air mixture becomes expanded by heat and carries with it the steam generated from the water forming a compound fluid of great elastic force, which is conveyed to the engine.

Instead of keeping the coils full, the supply may be so proportioned that the whole may be converted into steam in passing up the coiled pipe.

"The proportion of air and water may vary "one cubic foot of "water, with a quantity of air at a pressure of about 250 lbs. on "the square inch, is equal to from 20 to 50 cubic feet of air at "atmospheric pressure." The generator affords a copious supply at 250 lbs. per square inch.

A pressure gauge, a damper, and a method of generating elastic fluid from spray, mist, or foam are described.

[Printed, 1*s*. 6*d*. Drawings.]

A.D. 1858, March 19.—N° 566.

MENNONS, Marc Antoine Francois.—(*A communication.*)—(*Provisional protection only.*)— Machine for producing motive power consisting,—First, of a pendulum, which, after receiving an oscillating motion by the hand acting on a cord, comes in contact with springs, which make it rebound and continue oscillating. The motion is assisted by the gravity of water or other liquid in tubes at the bottom of the pendulum. Secondly, in the combined action of balance levers, and pendulums, the toothed segments of each of which gears with the toothed vertical segmentary arm of each lever. Thirdly, in a tubular wheel or drum, put in motion by gearing, in connection with the balance levers; water contained in the drum rises by the action of centrifugal force into tubes or compartments, and presses

on the circumference of the drum, which acts as an ordinary fly wheel.

[Printed, 4*d*. No Drawings.]

A.D. 1858, April 14.—N° 804. (* *)

MENNONS, MARC ANTOINE FRANCOIS.—(*A communication.*)—(*Provisional protection only.*)—"Improvements in obtaining motive "power, and in apparatus connected therewith."

Motive power is obtained by the employment of air in combination with water. The apparatus consists of a framing provided with wheels to run on rails. On it is placed a receiver filled with compressed air. A pipe issuing from the receiver communicates with an air cylinder furnished with a slide valve and piston. To the opposite end of this piston another is fitted, and which works in a cylinder containing water. The air is compressed in the receiver by the framing on which it is mounted being propelled along the rails. When the receiver is sufficiently charged, the compressed air is admitted into the air cylinder. The piston placed at the other extremity of the rod and immersed in water acts as a point of resistance to the first piston.

[Printed, 4*d*. No Drawings.]

A.D. 1858, April 23.—N° 902.

YORK, JOHN OLIVER.—(*A communication from Bernard Hughes.*)

" Obtaining power when bisulphuret of carbon is used." The generator of the bisulphuret should consist of a vapour-tight cylindrical chamber, into the ends of which a number of vapour-tight small tubes are inserted. This is placed in an ordinary steam boiler, or in a separate steam chamber. The vapour is passed through a pipe to the working cylinder of an ordinary steam engine, and is then exhausted into a surface condenser, and therein condensed. The bisulphuret is thence pumped into the hot well, and thence into the generator. The vapour is thus used without mixing it with steam.

[Printed, 4*d*. No Drawings.]

A.D. 1858, April 30.—N° 969.

CLARK, WILLIAM.—(*A communication.*)—Burnt air motor.

The furnace is closed, and consists of a metal vessel, to the

bottom of which two concentric cylinders are rivetted, and to the top of which another cylinder is rivetted. A fourth concentric cylinder is also united by a hermetical junction to the top of the interior lower cylinder, and divides the space between the first two concentric cylinders into two parts or annular spaces. Air is forced into each of these spaces. That forced into the upper outer space passes above the fuel, and unites with and reduces the products of combustion to a proper temperature. That forced into the lower and inner spaces is admitted to the top of the fuel by a series of apertures in the innermost cylinder. Air is also forced in at the lower part of the fuel through a nozzle. The furnace may thus be made either at the same time or successively a blast or a reversed combustion furnace. A certain quantity of water may be injected in a subdivided state, and thrown on to the combustion in ignition, or may be vaporized by passing it in a very subdivided state through currents of gas and burnt air. The first mode has the effect of leaving the salts of sea water injected in the carbonaceous mass. Water may sometimes be usefully introduced directly under the fuel in ignition. It then rises by capillary attraction to a certain height, and is evaporated, leaving the salts at the bottom of the furnace. To retain the particles of coal, cinders or salt, the current of heated gases is made to pass through a truncated cone, at the bottom of which these substances are deposited. The burnt air passes into a cylinder with a piston, which is united with the piston of a blowing cylinder that supplies the furnace. Water is injected in as subdivided a state as possible into the blowing cylinder to reduce its temperature. This water will enter the furnace as much in a state of steam as in a vessicular condition, and increases in volume, thus augmenting the power of the machine. The inspiration of the air in the blowing cylinder is through slide valves, and the driving back of it, by clack valves in the interior of the slide valves. The air from the motive cylinder may be used to heat the air going to the furnace by making the exhaust air pass through faggots or bundles of wire alternately with the fresh air from the blowing cylinder. The hot air may be also used to heat the water, either by making it circulate in an apparatus of the kind used for heating water, or by injecting cold water into the gaseous current.

[Printed, 3*s*. 8*d*. Drawings.]

A.D. 1858, May 5.—N° 996.

ARCHIBALD, Charles Dickson.—(*A communication from Henry Munro Paine.*)—(*Letters Patent void for want of Final Specification.*)—"Treating air and gases" "for purposes of motive "force." This consists in saturating "air or gas with water to "its full capacity of retaining the fluid in a separate condition "previous to its contact with the heated surfaces." Its "volume "will be greatly increased when in contact with heated surfaces."

[Printed, 4*d*. No Drawings.]

A.D. 1858, May 17.—N° 1096.

WITTENBERG, Julius.—(*Provisional protection only.*)—"Im-"provements" in "engines actuated by air." There are two cylinders each of which has two pistons connected together by springs which allow freedom of "motion in the separation or "approach of the two pistons yet at the same time are capable of "transmitting considerable power from one piston to the other." The piston rods project from the opposite ends of the cylinder and one is connected with the cranks and shafts to which the power is to be communicated, the other to the end of a beam like that of an ordinary engine. The beam works two double acting air pumps by which air is exhausted between the one piston and the cover or end of the cylinder, and is forced in between the other piston and the opposite end.

[Printed, 4*d*. No Drawings.]

A.D. 1858, May 29.—N° 1211. (* *).

DOLD, Alexander.—(*Provisional protection only.*)—Improved apparatus "applicable as a motor for all machinery usually turned "by hand, horse, or other power," and for other purposes.

"On an upright hollow shaft, the upper end of which shall be "in the open air, I fix a horizontal circular plate at any con-"venient distance; above this a ring is placed, and over the ring "a dome. Vertical bars or plates (working diagonally) pass from "the circular horizontal plate to the ring supporting it, being "sustained thereby. These plates are so arranged as to allow a "greater or lesser quantity of air to pass through them to act on "fliers. A rod passes through the hollow shaft and circular "plate; on the top portion of this, and between the plate and

" ring aforesaid, certain volants or fliers are attached. The wind, " in whatever quarter it may be, passes through the diagonal " vertical plates, impinges on the volants, and having turned the " rod, passes out, the rod thus rotating works into a gearing " (according to the purposes required), and communicates motion " thereto. As the force of wind might turn the rod too rapidly, " if not prevented by an arrangement for closing or partially " closing the vertical plates, I regulate the supply. For prevent- " ing the descent of smoke (into chambers), the hollow shaft is " dispensed with, and instead of a bottom circular plate, a ring " only should be used."

[Printed, 4d. No Drawings.]

A.D. 1858, June 2.—N° 1243.

LUEDEKE, Johan Ernst Fridrich.—(*Provisional protection only.*)—Motive power engines consisting of two "collapsible air " vessels" on a common axis. The axis is supported on the lower end of a rod depending from an oscillating beam. The axis of the air vessels may be moved so as to elevate either vessel above the other. An air reservoir in which air is compressed and maintained at a regulated pressure communicates with the air vessels. When the axis of these is at the top of its stroke one air vessel is above the other and is in its collapsed state, the other being distended. The axis is then by the momentum of the engine forced down into water to such a depth that the air in the lower vessel will be forced into the reservoir and such vessel will collapse. The communication between the upper vessel and the reservoir is then opened and the air will be forced into it and this causes it to expand" "and thereby exerts a rising " force in the water." The communication between the collapsed vessel and the reservoir is cut off during the whole of the up stroke. On the expanded vessel arriving at the surface of the water the axis is turned so as to reverse the position of the vessels.

[Printed, 4d. No Drawings.]

A.D. 1858, June 17.—N° 1374.

HALE, George.—(*Provisional protection only.*)—Motion and power is imparted to a horizontal shaft by means of a series of weighted levers mounted on centres arranged round the shaft and supported by the arms of two wheels mounted on the shaft; the

levers being suspended on pins or studs fixed in the arms, and arranged so as to be steadily fixed on rests, while descending, so as to throw their weights towards the circumference of the wheels and pull them round. When the weights get near the bottom they are kept back and fixed near the shaft where they are kept by catches, near the top they release themselves, are forced outwards, and received on a plane on which they run till they arrive at the circumference.

[Printed, 4*d*. No Drawings.]

A.D. 1858, June 19.—N° 1390. (* *)

HALLDON, Richard.—(*Provisional protection only.*)—Engines worked by steam or atmospheric pressure.

The object of this invention is to obtain "an increase of power "at the crank from any given length of stroke of the piston." The crank, the connecting rod, and the system of levers called "lazy tongs" pinned to the crank, to the connecting rod, and to a fulcrum, cause the throw of the crank to be considerably greater than the length of stroke of the piston.

[Printed, 6*d*. Drawing.]

A.D. 1858, July 29.—N° 1710. (* *)

CAVAGGIA, Giuseppe, and SPINELLI, Anselmo.—(*Provisional protection only.*)—This invention consists in making the expansive force of gases, evolved by the slow combustion of nitrates and similar matters, available as a motive power. For this purpose nitrates, chlorates, fulminates, or other analogous explosive salts or compounds are mixed with suitable quantities of one or more inert, comburent, or other bodies, forming compounds, when fired, of regular slow combustion and generating gas, which may be made to subserve as a motive power. The compounded materials are fired in a closed vessel made suitably strong, and the gases evolved are caused to act on a piston working in a cylinder, or at any other suitable part of machinery to which impulse can be given. The heat may be utilized for generating steam, which may be commingled with the gases and used in combination.

[Printed, 4*d*. No Drawings.]

A.D. 1858, August 14.—N° 1858.

SMITH, James, and CHEASE, Sydney Arthur.—"Obtain-"ing and applying motive power."

This is for an "atomic engine." There are three reservoirs for compressed air with air pumps and working cylinders of different sizes and shapes. The pistons of the cylinders move a "primary "lever" or "power conductor" having "friction wheels running "on a perpendicular plane" and a "horn shape projection" at one end. The other end of the power conductor works the piston of one of the air pumps and the crank shaft of the engine. The other air pumps are worked by means of eccentrics on the crank shaft. The friction wheels of the power conductor, and the piston of the "primary cylinder" are raised and held in position during part of the stroke by a "secondary lever" connected with "cams" on each side of the "sweep of the shaft."

[Printed, 1*s*. 10*d*. Drawings.]

A.D. 1858, August 16.—N° 1870.

RICHARD, Pierre. — (*Provisional protection only.*) — Rotary motion is communicated to a fly wheel or drum provided with a series of caps fixed around near its periphery by means of a set of weights tied together to form an endless chain which is hung so as to run over two pulleys: the caps receive the weights which fall or run down along the periphery: the weights rise in a straight line and those falling being more numerous than those which are being raised, the difference of weight causes the wheel to rotate.

[Printed, 6*d*. Drawing.]

A.D. 1858, August 31.—N° 1980.

NEWTON, Alfred Vincent. — (*A communication.*) —"Improvements in air engines."

The first of these is applicable to engines where the cylinder is furnished with supply and working pistons. The heater or furnace is placed at one end of the cylinder, the other end being open. The supply piston is made hollow with a concave head towards the heater and elongated so as to form an open hollow cylinder. The hollow part between the two heads of this piston is filled with some non-conducting substance. The circumference of the outer head is notched similar to a cog wheel. This head is somewhat longer than the inner head, and has behind it a metallic packing ring, which moves back a little as the supply piston is moving out but at other times prevents the return of the hot air

in front of the piston. The concave head and prolongation of the supply pistons fits accurately a false side or telescopic tube attached to the cylinder. By this means the cold air which enters through the valve in the working piston is made to cool that portion of the cylinder in which the working piston moves. It afterwards passes through the notches on the outer head of the supply piston, and then must traverse the whole length of the telescopic tube until it reaches the extreme end of the cylinder from whence it must also traverse the entire length of the heater. The hot exhaust air also traverses the greater part of the tube before passing out by the exhaust valve.

The second part of the invention is a modification of the above arrangements applicable to engines with separate "supply" and "working" cylinders.

[Printed, 10*d*. Drawing.]

A.D. 1858, September 2.—N° 1995.

PITMAN, JOHN TALBOT.—(*A communication from William Atwood Royce.*)—"Pneumatic condensing apparatus."

It consists of a cylinder and a double convex hollow piston, sustained by a hollow rod. The lower end of the lower piston rod moves in a pump barrel, and is furnished with a valve forming a pump, by which water is forced through the piston, and thence over the cylinder and refrigerating tubes, through which the compressed air passes. Spray injections may also be used, and the cylinder may be immersed in water. Serial compression is obtained by using two or more cylinders, by which the injurious accumulation of heat is avoided. The compressed air is conveyed through tubes, conduits, or reservoirs, for the various purposes of motor power, aeration, ventilation, and other purposes. Thin coats of close grained metals, alloys, oils, or extracts are used to coat the inner surface of the reservoirs to prevent the escape of air.

[Printed, 10*d*. Drawing.]

A.D. 1858, September 4.—N° 2008. (* *)

ANDREW, DAVID.—"Improvements in apparatus for obtaining "motive power."

In this rotating engine, worked by steam, air, or other fluid matter, the cylinder is cast with two central trunnions on which it revolves on bearings in a fixed frame; this carries a stationary ring, in the plane of which the cylinder is fitted, its centre of motion being eccentric to the centre of the ring. The piston rod of the cylinder works out to a considerable extent beyond the end covers, and on each end of the rod is fixed a running wheel that bears against the inner surface of the stationary ring of the framing (which ring forms the actual piston guide). The fluid is admitted to and exhausted from the cylinder by passages in the trunnions, through ports operated upon by the direct oscillatory movement or by valves. If the piston is moving upward, the pressure of the fluid against it causes the upper anti-friction roller to traverse the surface of the frame, and this curvilineal motion is greatly assisted by the gravity of the lower portion of the cylinder, which causes the lower roller to traverse rapidly the inclined surface of the frame. During this movement the fluid above the piston passes off through the exhaust ports, and escapes through a pipe into the condenser or atmosphere. The momentum imparted to the cylinder by the downward motion of its lower end carries it beyond the vertical position; the fluid being now admitted to the upper side of the piston, impels the lower roller to ascend the incline of the frame; the overhanging weight of the upper part of the cylinder causes this ascent to be made with a trifling loss of power. In this manner, the revolution round the transverse axis of the cylinder imparts rotary motion to the shaft attached to the trunnion, which in its turn is used as a prime mover for other purposes.

[Printed, 8*d*. Drawing.]

A.D. 1858, September 24.—N° 2142.

PICKERING, PETER.—(*Provisional protection only.*)—"Atmo-"spheric engine."

This consists of a set of open cylinders with pistons worked by toothed wheels fixed on a common axis. At the beginning of the motion the pistons must be brought by main force to the situation in which the last piston rests at the bottom of its cylinder, the first is nearly at the open end of its cylinder, and the other pistons are in intermediate positions. There must be a vacuum under each piston. Afterwards, when the engine is permitted to start, the pistons will regulate themselves.

[Printed, 6*d*. Drawing.]

A.D. 1858, October 9.—N° 2253.

PASCOE, James Bray, and THOMAS, John Roberts.—(*Provisonal protection only.*)—" Improvements in condensing and " gassing smoke, which are applicable also to forcing and drawing " water, propelling ships, and drawing and forcing air to be " worked with animal, water, steam, or air power."

They consist in drawing the air and smoke from any given distance to any given point, passing it through the machine, turning it into gas or into water.

In propelling ships, water is taken from the bows of the vessel and discharged at the stern. The machine has a double-acting drawing and forcing piston with proper passages and valves to be worked with animal, air, water, or steam power, a cistern containing water and an apparatus for turning smoke into gas by burning the smoke from the outlet passage from one to seven times over.

[Printed, 6*d*. Drawing.]

A.D. 1858, October 12.—N° 2271. (* *)

SHAW, Thomas Cotterill, and COOPER, Frederic Henshaw.—" A new or improved construction and mode of working " engines by the agency of air or gases in conjunction with elec- " tricity for obtaining or producing motive power."

As an example, a locomotive engine, constructed according to this invention, is described in the Specification and shown in the Drawings. Condensed air is permitted to pass from a reservoir " in an intermittent stream to a reaction or other engine, which is " put into operation by the expansion and escape of the con- " densed air. On its passage from the reservoir to the engine " the air is exposed to an electrical discharge, whereby the elastic " force of the air is much increased."

To produce the electric force an electro-dynamic apparatus with a secondary coil is worked by means of a hydro-electric machine. The introduction of water in a finely divided state through the jets against the conductor is accomplished by allowing a portion of the condensed air from the reservoir to pass through a chamber into which water is injected.

Either the disruptive discharge or the heating effects of the electric force may be employed to increase the elastic force of the air or gas used to work the engine.

The actions of the double-acting condensing pumps, "valves, " contact breaker, and other moving parts are effected from the " *main shaft of* the engine."

The arms of the reaction engine rest upon friction rollers, and are kept cool by means of water, which is admitted to the annular groove in which a rim attached to the arms revolves.

[Printed, 6*d*. Drawing.]

A.D. 1858, October 12.—N° 2277.

SAUTTER, MAURICE.—(*A communication from Joseph Gill.*)—
" Improvements in air engines."

In Stirling's engine [No. 5456, Old Law] with twin " differen-
" tial air vessels and transferring plungers," a jet of steam is introduced into the air vessel when the plunger is at the cold extremity of the vessel, and a jet of cold water when the plunger is at the hot extremity. The lower end of each vessel is filled with water, the quantity of which is regulated by valves actuated by floats. In this way air is used saturated with moisture, and the steam and cold water assist the differential ends of the cylinders in communicating and absorbing heat. The piston may be kept air-tight by a stratum of water or may work altogether under water.

[Printed, 6*d*. Drawing.]

A.D. 1858, November 4.—N° 2464. (* *)

NAPIER, JAMES ROBERT. —(*Provisional protection only.*)—
Improvements in obtaining motive power by means of heat.

This invention relates to the working of engines by steam or gas, and consists in heating the steam or gas by subjecting it to the action of pipes, or other passages, through which currents of hot liquid are made to circulate; these currents are not intended to form any part of any body of liquid from which the steam or gas may be generated.

[Printed, 4*d*. No Drawings.]

A.D. 1858, November 4.—N° 2467.

BROOMAN, RICHARD ARCHIBALD. — (*A communication.*) —
" Treating air and gases and the employment of the same for
" obtaining motive power."

The induct pipe of the air pump communicates with a tank filled with wicking or other substance having capillary properties hanging and having the lower end immersed in water. The air which supplies the pump passes through this tank, and may be

mixed with air in its normal condition by means of an opening in the induct pipe closed by a valve connected with the governor of the engine. The heater is in the form of a hollow ribbon concentrically coiled. The exhaust port in marine and stationary engines is made to communicate with the moistening tank, and the exhaust air passes through a series of wire gauze diaphragms kept wet, to the air pump.

[Printed, 6*d*. Drawing.]

A.D. 1858, November 9.—N° 2503.

DAWES, John Samuel.—Machine to be used for cultivating land, and a new method of actuating such machine and other machines used for the like operations.

The 2nd part of this invention consists in compressing air by means of a wheel or engine actuated by a stream of water, or of any other motive power engine, into strong metallic tubular or other portable receivers. These are filled at any convenient source of power, and are then transferred to the agricultural engine, the compressed air serving instead of steam.

[Printed, 8*d*. Drawing.]

A.D. 1858, November 11.—N° 2530.

WRIGHT, Robert, and MERCER, Thomas James, the younger.—(*Provisional protection only.*)—"Motive power engine."

This consists of a series of condensing pumps worked by eccentrics fixed on the main shaft of the engine so that the strokes of the pumps follow each other in regular succession. The air is condensed by these into a reservoir provided with a safety valve, and is thence conducted into a cylinder and acts upon a piston. The motive power thus obtained is communicated to the shaft by which the pumps are worked.

[Printed, 4*d*. No Drawings.]

A.D. 1858, November 15.—N° 2563.

PREDAVALLE, Bartolommeo.—(*Provisional protection only.*) —Motive power is produced by the vertical pressure of a column of fluid alternately cut off and restored.

A vessel consisting of two parts kept in contact has a pipe communicating with its interior and filled with fluid to obtain *the pressure* equal to the weight of a column having the diameter

of the vessel's interior and the height of the pipe. The bottom of the vessel is connected to one end of a beam, to the other end of which is connected a similar apparatus. The pipes are each provided with valves acted on by the motion of the machine so as to open and close alternately. When one is open the column of fluid in it will act on and force down the vessel in connection with it. Liquids or vapours, gaseous or aeriform fluids may be used.

[Printed, 4*d*. No Drawings.]

A.D. 1858, November 29.—N° 2708.

STARBUCK, Moses.—(*Provisional protection not allowed.*)—" My invention consists in the application of a static pressure to " produce a continuous movement, which movement is effected " in consonance with the settled laws of mechanical philosophy " by means of arrangements of mechanical devices heretofore un- " developed." By these the pressure is converted into a continuous movement, from which the pressure is given off (minus the friction of the engine) for the purpose of moving any machinery to which the engine can be applied.

[Printed, 4*d*. No Drawings.]

A.D. 1858, December 2.—N° 2758. (* *)

TYSSEN, Jacobus.—(*Provisional protection only.*)—" Improve- " ments in obtaining and applying motive power."

Motive power is obtained " by means of compressed air and " water combined and made to act upon a wheel enclosed in a " case to prevent the water escaping before it has produced its " effect. The compression of the air and water is effected in an " air-tight vessel by the aid of force pumps," worked by the motive power thus obtained, or by an auxiliary engine, or otherwise.

[Printed, 4*d*. No Drawings.]

A.D. 1858, December 13.—N° 2853.

ROUSSEL, Joseph Marié.—(*Provisional protection only.*)—Motive power air is compressed into a reservoir by a hand pump, and then used to set in motion different pumps, which, by their clappers, renew the air in the reservoir, and also introduce it into a great reservoir, until it has accumulated sufficiently to be used

as a motive power. During the action of the water the pumps supply air sufficient to compensate for that used.

[Printed, 6*d*. Drawing.]

1859.

A.D. 1859, January 18.—N° 151. (* *)

ARCHIBALD, CHARLES DICKSON.—(*A communication from Henry Munro Paine.*)—" Generating force."

This invention consists in so constructing a piston that, when acting under the pressure of fluid bodies, the resistance it meets or generates shall be made to assist the process of displacing, condensing, or exhausting without waste of the elements employed. "Instead of the usual cylinder I construct a case . . . " having parallel sides. The follower is composed of two " planes, of such width as to fit exactly between the sides . . . " and of the length necessary to secure the required amount of " displacement. These planes are jointed at their junction, and " attached to the piston rod by lugs or links, and are packed " with leather, rubber, or other suitable material to prevent leak- " age. The piston so constructed is called a 'bi-valve,' and if " we assume that the planes are each four inches long and one " inch wide, then when the piston rod has been drawn out so " as to cause the planes to stand at right angles with each other, " . . . eight cubic inches of the superincumbent fluid will have " been displaced. . . .

" To obviate or lessen frictional resistance, I adapt friction " rollers to the planes of the bi-valve, or suspend the toes of the " planes by rods or levers within the case, and so adjusted as to " swing like a pendulum, and to allow the required motion to " take place without undue pressure or friction."

The fluids in the case are subjected to a high degree of pressure.

[Printed, 8*d*. Drawing.]

A.D. 1859, January 24.—N° 213.

LAUBEREAU, JOSEPH.—Air engine.

The heating chamber has double U-shaped sides and communications between them. A grooved piston made of some high

conducting metal, such as bronze, works in it without touching the sides. The top of the piston is made into a chamber filled with non-conducting substances, such as lampblack. On this again is cotton or like substance. This piston forces the air from the cold end of the chamber through the heated end or a pipe to a cylinder, where it drives forward a piston. The piston of the heating chamber in its return stroke draws the air back to the cold end of the chamber, and the working piston is forced back by the pressure of the atmosphere aided by a partial vacuum. By employing two heating chambers, each connected with one end of the working cylinder this may be made double acting.

[Printed, 1*s*. Drawing.]

A.D. 1859, February 4.—N° 318.

HART, JOHN WOOLLEY.—(*Provisional protection not allowed.*) —Raising water or other liquids, and compressing and forcing fluids, atmospheric air, or other aeriform bodies.

This is done by a tube of iron or other material, in which a slot is cut, and around which sheet zinc or copper is coiled, allowing a distance between each wrap of the coil corresponding with the width of the slot. A hollow spindle of the same area as the slot is fixed through the centre of the tube. One end of the spindle is open, and enters a strong chest to which is attached the pipe or hose to conduct the water to the required height. A large outer box is kept just half full of water, and by turning the coil air and water is forced into the inner chest. The water passes up the pipe or hose, and the air may be used to force water from a chest into the receiving chamber, or to feed the pump or engine, or else it may be discharged through a series of columns of water, each containing a wheel similar to a water wheel. By these means, or by heated air through the same means, power may be obtained.

[Printed, 4*d*. No Drawings.]

A.D. 1859, February 7.—N° 341. (* *)

CRISPIN, WILLIAM HENRY.—(*Provisional protection only.*)— " An improved atmospheric and hydraulic engine for sailing and " steam vessels."

" The elemental power is obtained by the oscillation of a pen- " dulum, the vibration whereof is caused by the motion of the

" ship; suitable arrangements of wheelwork or other necessary " contrivances and combination of machinery being actuated by " the pendulum when in oscillation." The motive power thus obtained " may be used for the condensation or exhaustion of " atmospheric air," and other purposes.

[Printed, 4*d*. No Drawings.]

A.D. 1859, March 9.—N° 609.

PILBROW, JAMES.—(*Provisional protection only*.)—A flexible elastic tube such as "red mineralized india rubber" is placed between two rollers or a roller and a flat surface, one end being connected with an air pump and the other left open to the atmosphere.

Upon the air being exhausted, the rollers will move towards or along the collapsed part with a traction or propelling force in proportion to the power necessary to collapse the tube. If the tube be made so as to require fourteen pounds on every square inch to collapse it, the atmosphere would cause it to collapse, and the rollers would receive an effect to urge them forward to this amount. By laying such a tube along a line of railway or canal, a carriage or vessel might be propelled. If such a tube were placed within and around a circular air-tight chamber, one end being free and open within the chamber and the other passing out and open or connected with a condenser, a wheel with rollers similar to those described could be driven round by the action of steam (which would thus be a substitute for the air) and rotary motion given to machinery.

[Printed, 4*d*. No Drawings.]

A.D. 1859, March 18.—N° 692.

THIRION, ALBERT LOUIS.—Improvements in mills.

The swifts or wings are attached to a circle by pivots, and have the same action as doors. To the part opposite to the pivots wire rods are attached, the other ends of which are fastened to a moveable circle, by moving which the wings may be set to any required position. The moveable circle is provided with a rack so as to remain in the position in which it is set. The pall which holds the rack has a spring or other contrivance to render it elastic, so *that* the wings can change their position with variations in the

force of the wind. The mill is stopped by disconnecting the rack.

[Printed, 10*d*. Drawing.]

A.D. 1859, March 29.—N° 784.

MEEKINS, THOMAS MOSSOM. — (*Provisional protection not allowed.*) — Production of motive power, and of projectile and explosive force.

Gases are evoluted by electricity introduced into a cylinder mixed or separate at first (but during the latter part of the stroke of the cylinder the gases being mixed), and combined by an electric spark or other means. The gases may be heated or dried, or not, and the residuum resulting from the combination may be received into a receiver exhausted or not.

[Printed, 4*d*. No Drawings.]

A.D. 1859, April 29.—N° 1078.

BOSSHARD, HENRY.—(*Provisional protection only.*)—A motor or driving apparatus is constructed of "clockwork with weights "and barrels. As one of the barrels is being wound up by the "action of the wind, water, or other natural power upon the sails, "water wheel, or other apparatus connected with it for that pur- "pose, one of the weights will drive the other barrel, the axle of "which will set the clockwork in motion."

The object is to collect a power produced periodically and to convert it into a perpetual or fixed periodical movement.

[Printed, 4*d*. No Drawings.]

A.D. 1859, May 2.—N° 1093.

JUMELAIS, ANGE.—(*Provisional protection only.*)—An apparatus yielding illimited power rests on the principle of atmospheric pressure.

It "consists of a series of tubes tightly connected with each "other, each tube containing a helix of ordinary form which "actuates a shaft projecting from the said tube and operating an "external pulley. The issuing out of the said shaft from the "tube is to take place without any" "leakage, which can easily "be obtained by means of a stuffing-box lid. The permanent "pressure is obtained by means of a double piston sucking "pump which actuates one end of the connected tubes;" or by

means of a waterfall or rapid stream, in which case the tubes including the helices must be arranged so as to represent a siphon.

[Printed, 4*d*. No Drawings.]

A.D. 1859, May 6.—Nº 1138.

ANGERSTEIN, FREDERICK, CLEGG, ROBERT, and THORRINGTON, GEORGE.—Apparatus for obtaining motive power consisting of one or more cog wheels revolving loose on a shaft, with a rim or rims at the sides, and at the side of the rim or rims a square shaft to take a ratchet star or pawl wheel on a square box to fit pawls fixed and allowed to slide upon the square shaft to catch to the top or inner rim of the cog wheel. On the other side pawls or ratchet wheels to reverse the motion may be placed. The cog wheel is worked by two horizontal toothed racks, the ends of which rest upon extending arms to work in suitable grooves the reverse way to each other, to which motion is given by a lever fixed to two horizontal levers arranged to take the bearing of the whole leverage of the driving or cog wheel. On the shaft is a fly wheel or drum made to revolve at a required speed by the action of the cog wheel, and to impart motion to the wheel or vehicle by bands or other contrivances of an elastic pressure or otherwise by which additional leverage is given from the wheels and ground. "It may be used for all purposes for which "steam or other power is at present applied, or for increasing "such power to an almost unlimited extent."

[Printed, 10*d*. Drawing.]

A.D. 1859, May 9.—Nº 1164.

HUGHES, EDWARD THOMAS.—(*A communication from Aimé François Lapène.*)—Water saturated with ammonia is conducted through a spirally coiled pipe kept at a temperature of about 212° by steam or by a "furnace and water bath."

The pipe ends in a cylinder in the centre of the water bath from which the gas separated by the heat passes through a tube to act on a piston. A pipe furnished with a valve and a float counterbalanced by a weight serves to keep the water in the receptacle at a constant height and to conduct the surplus water which is made to pass through a set of tubes cooled by a current *of cold water* into the absorber. The gas after working on the

piston passes through a sieve of iron gauze into the bottom of the absorber where it is again taken up by the water.

[Printed, 1s. 6d. Drawings.]

A.D. 1859, May 17.—N° 1227. (* *)

NASMYTH, James.—"Improved apparatus for obtaining and "applying motive power."

"I form a kind of inverted syphon, and in the part connecting "the two limbs of the syphon together, I fit a valve or valves for "cutting off the connection between the two limbs of the syphon. "The one limb I connect with a reservoir or equivalent arrange-"ment or contrivance for supplying a head of water to the ap-"paratus, and in the other limb I fit a piston from the rod of "which the motive power is taken." "In connection with the "bottom of the limb is an air-tight chamber, which is capable of "being opened to and cut off from this limb of the syphon by means "of suitable valves." "To set the apparatus in action, water "is let into the chambers forming the syphon, and the syphon "valve being opened, it will flow into both limbs, and the piston "will be caused to rise in its cylinder. When the piston shall "have reached the end of its stroke, the syphon valve must be "shut, and the valve communicating with the lower chamber "opened. The water will then flow into the lower chamber "(leaving a vacuum in the cylinder below the piston), and the "piston will follow the descending column of water. The "position of the valves must then be reversed, and a fresh column "of water allowed to flow to the second limb of the syphon, and "from thence through the lower chamber to the working cylinder "below the piston, and thereby cause the ascent of the piston, "and thus a continuous traverse motion of the piston in its "cylinder is obtained."

[Printed, 10d. Drawing.]

A.D. 1859, May 31.—N° 1345.

GAMBARDELLA, Philippe.—*(Provisional protection only.)*—This is for obtaining motive power from a mixture of hydrogen or oxygen exploded by an electric spark.

The cylinder and slide valve are modified by placing the entrance and exit parts on the contrary side from their usual position or in other suitable position at equal distances from the top of the

piston where the engine is worked at a great speed. Instead of the ordinary valve, a tap with several cavities and a second tap opening alternately are employed. The feed and discharge taps are about double the usual size. In high-pressure engines eccentrics are used to give the slide valve the back motion.

[Printed, 4*d*. No Drawings.]

A.D. 1859, June 2.—N° 1360.

PASCAL, Jean Baptiste. — "Improvements in hot-air "engines."

The air, more or less compressed, is heated and cooled in piston generators, each consisting of a chamber built above a furnace, and separated from it by a diaphragm of cast iron of considerable thickness at its centre, and gradually diminishing in thickness towards the circumference. This projects into the furnace, and takes up the greatest quantity of heat disengaged. In the chamber works a piston consisting, first, of a mass of cast iron fitted to the diaphragm, secondly, a layer of masonry for intercepting the heat, and thirdly, of two super-imposed plates, between which cold water constantly circulates. The receiver, or working cylinder, has a bottom of cast iron similar to that of the generators, and is heated by flues from the furnaces. The motive piston is of bronze, to transmit the heat it receives from the bottom to the heated air above. There is a reservoir for compressed air, which, by means of valves, reestablishes the initial pressure in the generators when diminished by reason of escapes. This reservoir has two casings, and an annular space between, into which water is forced by pressure from below, which thus establishes a hydraulic casing.

[Printed, 1*s*. Drawings.]

A.D. 1859, June 10.—N° 1413. (* *)

PICCIOTTO, Moses Haym.—"Improvements in apparatus for "producing or obtaining motive power."

"My invention consists in arranging and combining apparatus "in which motive power is produced by the gravity or pressure "of a permanent column of fluid in a stationary pipe, the base "of which is connected to a fixed cistern or chamber, to the "bottom whereof are attached a number of vertical flexible "*tubes, terminating* in and attached to a moveable plate, piston,

" or vessels, capable of travelling up and down (in guides or in " a cylinder), the flexible tubes bending and unbending as the " moveable plate, piston, or vessel rises and descends. This " plate, piston, or moveable vessel is also connected to one end of " a beam, the other end of which is connected to a precisely " similar apparatus. . . . . The gravity or pressure of the column " of fluid will act upon and force down the plate, piston, or " moveable vessel at that end, unbending the tubes, and bringing " down the corresponding extremity of the beam, whilst at the " same time communication is closed between the main pipe and " the flexible tubes at the other end of the beam, causing such " end to rise, its tubes bending accordingly, to facilitate which " operation a small quantity of fluid contained therein may be " let off to be pumped back into the main pipe. The action is " then reversed, communication being opened on the up side, " and closed on the down side, and so on, whereby reciprocating " motion is produced, and motive power obtained."

" The term fluid " is intended to " comprise water and other " liquids, gaseous, and aeriform fluids," &c.

[Printed, 8d. Drawing.]

A.D. 1859, June 11.—Nº 1415.

JAMES, JABEZ.—Motive power applicable to lifts or cranes, raising dock weights, grinding, pumping, and other purposes, where water, steam, or air pressure is available.

It consists, first, in using a cylinder and piston, the rod of which is fitted with a cross head working in guides between the two sides of an endless chain passed over two notched pulleys. The cross head has two palls set in reverse directions and gearing into the two sides of the chain, so as to impart to it a continuous travelling motion when the piston is forced backwards or forwards, and thus rotating the spindles from which motion may be transmitted. The valve motion preferred consists of a cylindrical valve casing, and a cylindrical hollow valve formed with a flange at each extremity, so as to leave an annular space between the valve and the casing. The flanges are wide enough to close the ports leading to the ends of the cylinders. The valve is connected loosely to a spindle by a boss through which the spindle has a certain amount of longitudinal play. An arm on the cross head before the piston reaches the end of its stroke, comes in contact with a collar, and drives

with it the valve spindle, but not the valve. By the time the spindle has arrived at the end of its free play, a bob lever connected with the valve will be driven into a vertical position, and on being tipped over will draw with it the spindle and valve, effecting the instantaneous change to the required position for the next stroke.

[Printed, 1s. 1d. Drawings.]

A.D. 1859, June 18.—Nº 1467.

LUIS, JOZÉ. — (*A communication from Bernard Zacharie Lethiers.*)—Windmill.

The sails are twelve in number, and are made of thin battens. Each is composed of two parts, the sail and the countersail, rendered solid by metal plates or bands, and is fixed by springs on a wooden arm. A little windmill placed in front causes the position of the sails to vary according to the force of the wind, by winding up chains received in grooves cut in the nave in which the small sails are adjusted, and fixed at one end to a square of iron fixed on the large sails. This mechanism is only adjusted to three sails, but the others are joined by jointed levers, so that they all act together. The springs which maintain the sails permit them to yield as required by the force of the wind.

[Printed, 10d. Drawing.]

A.D. 1859, September 30.—Nº 2221. (* *)

JOHNSON, JOHN HENRY.— (*A communication from Messieurs Dalifol and Company.*)—Reworking the waste steam of steam engines.

The steam which has produced its effect in the steam cylinder passes by the exhaust pipe into the first cylindrical receiver, which is contained within a water bath of a temperature of 85° cent. This temperature is regulated by a jet of steam from the boiler, and by jets of cold water supplyed by a pump through a rose jet which directs the water to the top of the receiver, whence it flows through apertures into the water bath which prevents overheating this portion of the chamber. In this receiver the steam undergoes partial condensation which facilitates its expansion and escape from the cylinder. From this chamber the steam passes by a lower pipe to the second chamber enclosed by the bath, similar in every respect to the preceding apparatus. The water

of this second bath has a temperature of 88° cent., which is rather higher than that of the first one, and by vapourizing the more or less watery particles forms the starting point of the reheating or regeneration of the steam. It is rapidly drawn through the pipes of the pump, and thence is forced along the pipes to the two coils one on each side of the furnace and placed near it; here its pressure is encreased by an encrease of heat, and which is regulated by the dampers. At this point a jet of steam from the steam chamber of the boiler is directed into the coils, and mixes violently with the surcharged steam they contain, still further encreasing its pressure, and driving it along the tubes into the boiler, thereby producing a vacuum which effectually exhausts the steam from the body of the pumps and passages it has to travel. The steam is now in a condition to be again directed into the cylinder of the engine, where it operates upon the piston, is subsequently submitted to the action of the regenerators, and thus is indefinitely reworked without any additional cost of fuel or loss of force.

Some modifications are suggested; the coils may be replaced by straight pipes; more than two pumps may be used; the water in the baths may be replaced by air; and the entire apparatus may be worked by gaseous vapours.

[Printed, 8*d*. Drawing.]

A.D. 1859, October 12.—N° 2325. (* *)

TANGYE, James.—(*Provisional protection only.*)—" A new or " improved method of actuating certain kinds of motive power " engines, and in the distribution of motive power."

" In the neighbourhood of mines, or in other localities where " coal is cheap, I erect low-pressure or condensing steam engines, " which said engines are made to work condensing pumps. By " means of the said pumps I condense air into accumulators or " reservoirs to any desired pressure. With the said accumulators " or reservoirs I connect a series of pipes, somewhat similar to the " pipes by which gas and water are usually distributed in towns " by means of the said pipes. The condensed air can be trans- " mitted to the locality where it is wanted, and applied in place of " steam to actuate the engines usually actuated by steam."

[Printed, 4*d*. No Drawings.]

A.D. 1859, November 10.—N° 2561.

DAY, WILLIAM.—(*Provisional protection only.*)—The invention consists in an arrangement of paddles or float boards applicable for propelling vessels and for converting the force of the wind into a motive force.

The advancing paddles are made to advance in an edgeway direction, gradually feathering or altering their position in rotation. This is done in vessels by guide rods supported in suitable brackets when the paddles are made at the bow, and by a toothed wheel applied on the inside plate of the paddle wheel when paddle wheels are used. The toothed wheel derives its motion from a fixed pinion with a differential motion formed on the same and acts on the axles of the floats or paddles. When applied to windmills they may be used horizontally or vertically.

[Printed, 4*d*. No Drawings.]

A.D. 1859, December 7.—N° 2767.

ANDERSON, JAMES.—In this invention coal is first partially burned and wholly distilled in a furnace, into which the proper quantity of air is introduced. The gas obtained is introduced into the combustion chamber, where its combustion is effected with the aid of a suitable quantity of atmospheric air which has passed through a hot porous material. The products of combustion pass through a second porous mass to the space below the working piston, which is raised by the continual expansion of the gaseous matter. To prevent the loss of heat the piston has attached to its lower surface cylindrical shells, which in the descent of the piston enter narrow recesses separated by similar shells. On the descent of the piston the gases pass down through the porous medium, depositing therein the whole or the greater portion of the heat remaining in them and escape by a suitable valve. Air is admitted above the piston during its descent, becomes compressed, and is forced into a reservoir which supplies the gasifier and combustion chamber. In some modifications the gas, after acting on the under side of the piston, is made to act on upper side, or on the upper side of a 2nd piston, or to pass into a reservoir communicating with the combustion chamber. In others, the porous matter is given a motion like a piston. Jets of water may be used to absorb the heat rendered

sensible during the compression of the air, or this heat may be absorbed by additional porous masses.

[Printed, 10*d.* Drawing.]

A.D. 1859, December 12.—N° 2815. (* *)

GENNERICH, PRINCE GUSTAVE.—" A new system of motive " power applicable for working cranes and wheels."

The Provisional Specification of this invention is as follows :—
" The present invention is a motive power applied to a crane for " raising goods instead of multiplied hands or steam power. The " principle consists of a heavy weight sliding on an iron rod " which is attached to the axis of a wheel, and by means of a " snap fastened to the rod causes the wheel to revolve. By means " of the heavy sliding weight the cylinder to which the chain is " attached is made to act with great power. The same power may " be applied in any case where a wheel or crank is required to be " turned, and by the heavy weight sliding to and fro the iron rod " acts as a balance and creates a power, and by moving up and " down turns a wheel or crank."

The final Specification, or rather the document filed as such, consists merely of a number of short references to a drawing annexed thereto, and which represents a complicated arrangement of levers, weights, chains, wheels, and other apparatus, these references forming in fact little more than a list of the names of the several parts of which the machinery is composed. The latter has more the appearance of a locomotive engine than of a crane, but from the extraordinary character of the Specification it is impossible to understand how the mechanism is meant to operate.

[Printed, 10*d.* Drawing.]

A.D. 1859, December 12.—N° 2819.

LOUGH, GEORGE.—(*Provisional protection only.*)—A horizontal steam cylinder of a marine engine works a number of air pumps which force air into a "vessel, and which is used to work the " piston and so forth of a second cylinder, from the piston rod " of which the power is taken off."

The air pump pistons consist of a hollow conical saddle on which is fitted an india-rubber disc, having the edge covered with a belt of leather fitted to expand laterally by the expansive force of the india-rubber. An air-tight fire-place communicates

with the air cylinder, the air from which is there consumed by the fire after it has done its work. The heat aids to heat the boiler or the feed water. The incombustible gases fall to the bottom of the ash pit and are injected by an exhausting pump into the sea. The steam is condensed in a number of vertical pipes formed of an amalgam of lead and tin, through which the sea is allowed to flow.

[Printed, 4*d*. No Drawings.]

A.D. 1859, December 15.—N° 2851.

PREDAVALLE, Bartolommeo.—(*Provisional protection only.*) —A pipe or tube is fixed vertically into the upper part, and communicates with the interior of a vessel filled with fluid, so as to obtain the pressure equal to the weight of a column having the diameter of the vessel's interior and the height of the pipe. The bottom of the vessel is rigid and detached from but adhering to the other parts, forming an air and water-tight joint. The vessel is connected to one end of a beam at two points, forming pivots so as to move like the compass on a "Cardan movement." The cover of the vessel forms the bottom of a vacuum chamber, in the top and bottom plates of which are two plates through which a flexible pipe passes and communicates with the interior of the vessel and is connected to the frame. Between the pivots on which the vessel rests a chain is attached which passes under the vessel, and is fixed to the upper frame so as to turn the vessel up side down when it has completed its down stroke. The vessel is forced down by the pressure of the fluid on the bottom of the vessel and of the atmosphere on the top of the vacuum chamber. And when the vessel is turned over the action is inverted. There is a similar contrivance for the reversal of the vessel at the end of the up stroke, and on the other end of the beam is a similar apparatus. A reciprocating motion is thus produced.

[Printed, 4*d*. No Drawings.]

1860.

A.D. 1860, January 4.—N° 24. (* *)

MENNONS, Marc Antoine François.—(*A communication from Louis Diordor* Läserson.)—"Improvements in the pro-

" duction of motive power, and in the apparatus connected " therewith."

This invention consists in applying the ascensional force of air or gases developed under water to generating motive power, and in combining apparatus whereby this power is accumulated, transmitted, and applied. The principal element of this combination is a wheel or disc. On the circumference of this wheel are fixed at equal distances a number (say sixteen) of flexible air reservoirs, communicating with an equal number of tubular passages, which open in the nave. In the length of the fixed shaft on which this wheel is mounted, are formed two cylindrical cells by which the air is admitted to and discharged from the flexible reservoirs by the tubular passages, with which they correspond. The hydro-atmospheric wheel thus mounted, and immersed to the required depths in a suitable reservoir, is placed in communication by its hollow shaft with an air compressing apparatus, which in its turn is connected with the shaft of an ordinary hydraulic wheel. "The latter being set in motion " acts on the forcing apparatus, by which a jet of compressed air " is thrown into the hollow shaft of the hydro-atmospheric wheel " by the entry cell corresponding with the orifices of the fourth " quadrant or lowest immersed section of the latter. The air " injected following the tubular passages within its range enters " and inflates the corresponding flexible reservoirs, which thus " acquiring an ascensional force proportioned to their displacing " capacity and degree of immersion, carry forward the wheel in " their movement towards the surface. On reaching the water " line the tubular passages come into communication by the " nave orifices with the discharge cell of the fixed shaft, and " give egress to the air compressed in the flexible reservoirs, " which collapse simultaneously with the inflation of the suc- " ceeding series by which they have in the mean time been " replaced in the fourth quadrant. The latter following the " ascensional movement of their predecessors, give place to a " third series, and collapse in the same way on passing the sur- " face, so that each air reservoir on re-entering the water in the " continued revolution of the wheel presents comparatively little " resistance until it arrives at the turning point, when the com- " munication with the entry cell of the axle being again esta- " blished the movements above described are produced. The " force thus developed by the hydro-atmospheric wheel, which re-

" presents about three times that of the prime motor, may at this " stage be applied to the required transmissions of movement."

When a natural fall of water is not available, a supplementary apparatus is employed to produce an artificial fall. In this case the reservoir supplying the artificial fall sets in motion the hydraulic wheel, "and by the same process as above gives rise " to the same amount of force in the hydro-atmospheric wheel," " say 30 h. p.; a portion of this force, say, for instance, one- " third or 10 h. p. is absorbed in the movements by which the " water expended on the hydraulic wheel is thrown back to its " source, while the surplus, say, 20 h. p., remains independent, " to be applied as may be desired."

[Printed, 1*s*. Drawing.]

A.D. 1860, January 9.—N° 60.

COFFEY, John Ambrose.—Motive power obtained by means of ponderous bodies.

Part of the invention relates to producing motion by means of buckets of water fixed on an endless chain, the water being brought up again. In the place of water or other fluid, permanent weights may be attached to arms radiating from a centre, which arms draw close to or project from the wheel, so that the leverage is shortened as the weights are carried up. This is done by an eccentric, a spring, or otherwise. Or the weights may be attached to an endless chain. The complete Specification describes only methods of obtaining motive power from ponderous bodies possessing mobility, as water or mercury.

[Printed 4*d*. No Drawings.]

A.D. 1860, January 11.—N° 72.

JAMESON, John.—Improvements in the invention described No. 514, A.D. 1858.

These consist in employing additional reservoirs which receive compressed air from the cylinders at the time this is heated, and give it back to the cylinder after the plunger has completed its stroke. They are made to communicate one at a time successively with the cylinder when the plunger has just reached the bottom of its stroke, and again in the reverse order at the end of the upward motion of the plunger. By these means a portion of

air is received from the atmosphere at each stroke and passes by its simple expansion into its final reservoir, the accumulations in which may be used for any purpose for which compressed air is applicable.

[Printed, 4d. No Drawings.]

A.D. 1860, January 11.—N° 79. (* *)

BOUTET, CHARLES THOMAS.—(*Provisional protection only.*)— "A new mover applicable to all branches of industry, and "designed to replace the steam, the aero-hidraulic mover."

"The apparatus is composed of, 1°, a basin or recipient full of "water; 2°, two pedestals with coussinets fixed in the interior "centre of each longitudinal side of the recipient; 3°, a mover "axe in the coussinets; 4°, two iron cross bars fixed on the axe "destined for the supporting of the cups or balloons; 5°, four "wooden cups lined with zinc and covered with an air-tight "cloth, which gives it the shape of a balloon when the cup is "swelled; 6°, a counterpoise adapted to the lining is designed to "send back the air from one cup to the other when they are "come to the perpendicular line; 7°, a tube, whose each ex- "tremity is fixed in an opening practised at the bottom of the "cups, and giving a circular freedom to the air when it is pressed "by the counterpoise." "My system has for its foundation air "and water, and for its principle the difference that there is "between the weight of a volume of air and that of the same "volume of water."

[Printed, 4d. No Drawings.]

A.D. 1860, January 17.—N° 119. (* *)

RUCHET, DAVID FRANÇOIS LOUIS, VONWILLER, JACOB, and SEILER, FREDERICH.—This invention relates to a rotary machine, which will operate either as a steam engine, water wheel, or pump, and will transmit power to a distance. It "consists "of a machine or engine composed of a bucket or float wheel or "of an endless chain carrying buckets or floats, which wheel or "chain is enclosed in a case containing water, mercury, or other "liquid, and caused to revolve therein by some moving fluid, "such as compressed air, water, or steam, admitted through a "pipe carried, by preference, to the lower part of the case. A "pinion is placed above the bucket or float wheel, and is geared "into thereby; the pinion is mounted on a shaft working

" in bearings formed in the sides of the case, and from this " shaft rotatory motion is transmitted. The machine may be " employed for the production of compressed air by reversing " the motion of the bucket wheel or chain, whereby air will be " drawn into the case, a portion of which will be taken into " every bucket as it rises during the revolution of the wheel or " chain just clear of the liquid. The air in each bucket will " become compressed according to the density of the liquid " through which the buckets take it, and on the buckets reach- " ing the lower part of the case the compressed air issues through " apertures provided in the sides thereof into a pipe or pipes, and " thence for use, or into a receiver. By attaching a pipe to the " upper part of the reservoir the machine acts as an exhaust " pump." When employed as a rotary engine, mercury as the liquid in the case is used in a heated state, in order to prevent the condensation of the steam. After use in the engine, the steam is conveyed to a condenser, where any particles of mercury sublimated by the heat of the steam may afterwards be collected. A modification of the apparatus for compressing air is exhibited and described, wherein the bucket or float wheel is replaced by a tubular coil.

[Printed, 8*d*. Drawing.]

A.D. 1860, January 30.—N° 240.

JOHNSON, John Henry.—(*A communication from Stephen Wilcox, the younger.*)—Hot air engine.

In this engine there is a single acting working cylinder and piston, and a changing and supply cylinder and piston. Between them is placed a chamber communicating with both cylinders below the pistons, and containing a regenerator constructed so as to gradually increase in area from the cold to the hot side, and above it is the valve and valve chest, a single valve performing the office of induction, eduction, and equilibrium valve. The lower parts of the cylinders and chambers form the heating surfaces, in contact with which the products of combustion circulate. By means of the valve and the changing and supply piston the hot exhaust air is forced through the regenerator into the atmosphere, and a fresh supply of cold air is admitted above the changing piston and passed down through the regenerator to the heating surfaces. The air is heated either by *flues or* by jets of gas which are pumped in at proper intervals

below the regenerator and ignited. When a flue is used, the draft and heat of the furnace is regulated by means of a chamber filled with mercury or some fluid that vaporises at a high temperature, and a diaphragm, which is raised by the vapour. The upper part of the working piston is made hollow with a communication with the atmosphere to prevent the heat accumulating at the rubbing parts.

[Printed, 1*s*. Drawing.]

A.D. 1860, February 1.—N° 263.

HUDDART, George Augustus, and HUDDART, Joseph Durham Erskine.—(*Provisional protection only.*)—A series of cylinders open at one end, and each fitted with an air-tight weighted piston, are filled with air or aeriform body, and placed around the periphery of a wheel. The whole apparatus is immersed in water. The pistons as they come round compress the air or gas, and reduce the buoyancy of the cylinders, but when they become pendent they act in the opposite direction, and expand the confined air or gas. The wheel thus becomes loaded on one side, so as to ensure its continuous rotation. Cams or other mechanical equivalents may be substituted for the weights.

[Printed, 4*d*. No Drawings.]

A.D. 1860, February 2.—N° 268. (* *)

INGHAM, William, and HINCHLIFFE, William.—(*Letters Patent void for want of Final Specification.*)—This invention relates to "apparatus for applying steam and other vapours, gases, " or fluids to the production of motive power, and which may " also be used for a pump or gas exhauster or other similar " purpose."

"Within a hollow cylinder is placed a solid cylinder or roller " of less diameter, so that at one point the circumferences of the " two cylinders shall touch. The steam or other vapour, gas, or " fluid is let into the space between the two cylinders at one side " of the point where they touch, and is allowed to escape at the " other side of that point. The steam or other vapour, gas, or fluid " drives a lever or piston which is attached to the inner cylinder, " and the power is generated by the revolution thus occasioned of " the lever and the cylinder to which it is attached; the outer cylin- " der is fixed. The lever or piston is attached to the revolving " cylinder in such a manner as to adapt its position in revolving

" to the varying width of the space between the cylinders, and " thus to work steam tight in that space. In cases in which the " force of the vapour, gas, or fluid consists of weight or pressure " rather than force of expansion, the invention may be varied by " making the cylinders concentric, and arranging the admission " and escape of the vapour, gas, or fluid at such points as will " secure the greatest amount of power."

The invention may be modified by keeping the cylinder to which the piston is attached stationery, and allowing the outer cylinder to revolve and give off power. When used as a pump the axis whereon the inner cylinder is fixed is driven by power from another engine.

[Printed, 4*d*. No Drawings.]

A.D. 1860, February 2.—N° 272. (* *)

REDRUP, George.—(*Provisional protection only.*)

This invention relates to "the means of and apparatus for ob- " taining and applying motive power whereby perpetual motion " may be obtained." It consists of cylinders with pistons actuated by simple or compound levers; elbows are attached to each end of the smaller cylinder to which two large cylinders are fixed; the piston rods of the large cylinders are jointed to levers, which have fulcrum bearings cast to the cylinder covers. A weight in a fixed or moveable position is attached to the long end of each lever; the piston rod of the small cylinder gives off the motion generated; simple or compound levers which are actuated by the machinery when in motion are employed, their short ends are placed close to the weights on the levers attached to the cylinder, so that a small weight applied at the long end of the under lever will raise both the weight and lever attached to the cylinder, which removes the pressure from the cylinder piston. An open communication or water passage exists between the two large cylinders and the small cylinder, which is filled with water or other fluid, as well as the water passages and the space up to the piston in each large cylinder. The levers, weights, and pistons alternately force the water and piston of the small cylinder in opposite directions, the traverse increasing in proportion to the difference in the area within the circumference of the small and large cylinders respectively, assuming this to be one-sixth, the small piston will move six inches, while the large pistons make only one inch of traverse. When the piston and small cylinder have moved their proper

distance the machinery takes off the pressure by the levers from the end forced down and puts the whole pressure on the water in the other cylinder so as to force back the small piston, and thereby generate perpetual motion. The invention may be applied to all steam engines now in use.

[Printed, 4*d.* No Drawings.]

A.D. 1860, February 8.—N° 335. (* *)

JOHNSON, JOHN HENRY.—(*A communication from Jean Joseph Etienne Lenoir.*)—" Improvements in obtaining motive power, and " in the machinery or or apparatus employed therein."

"The said invention consists in the application and use of an " inflammable gas mixed with a proper proportion of atmospheric " air and ignited inside a cylinder by the aid of electricity, the " expansion thereby produced acting upon the piston and im- " parting motion thereto, which motion may be transmitted in " any convenient and well-known manner to a driving shaft." Either a disc valve or two slide valves on opposite sides of the cylinder is or are used, the slides " are held against the valve " faces of the cylinder by springs or screws. Suitable means " are employed for admitting atmospheric air into the cylinder. " Along with this air there is also admitted, by means of a pipe " employed for that purpose, a supply of ordinary lighting or " other inflammable gas or vapour. Inside the cylinder are fitted, " either at the middle or at both ends thereof, one or more pairs " of insulated platinum or other wires in connection with a bat- " tery, and so disposed than an electric spark will be produced, " which will instantly ignite the mixture of air and gas contained " in the cylinder on one side of the piston, and by the expansion " of the air so produced force the piston to the opposite end of " of the cylinder. The supply of gas is regulated by a suitable " stop-cock and governor."

The vapour from heated solid or liquid hydro-carbons "may ' be employed in this engine for heating and expanding the air " and its combinations."

A " director" is used to complete the electric circuit at the proper times. This instrument consists of a wheel commutator on the fly-wheel shaft, the metallic segments of which are suitably connected with a Ruhmkorff's coil, and with the above-mentioned platinum wires.

[Printed, 10*d.* Drawing.]

A.D. 1860, February 8.—N° 342.

HUDDART, GEORGE AUGUSTUS.—(*Provisional protection only.*) —The principle of buoyancy is applied for obtaining motive power. Air vessels connected in pairs by tubes are set around the periphery of a wheel or mounted upon an endless belt. Each is furnished with a weight free to move in parallel guides as the wheel rotates, which by its downward pressure compresses the air vessel and forces the air into the vessel on the opposite side in which a vacuum is being formed by the drag of its weight. The whole apparatus is immersed in water.

[Printed, 4*d*. No Drawings.]

A.D. 1860, February 10.—N° 365.

HUDDART, GEORGE AUGUSTUS.—(*Provisional protection only.*) —Cups are arranged round the periphery of a wheel immersed in water, and the wheel is caused to rotate by injecting air into these cups by means of an air pump and bent pipe.

[Printed, 4*d*. No Drawings.]

A.D. 1860, February 14.—N° 400.

WORTS, JAMES KING.—(*Provisional protection only.*)—Motive power.

Two cranks upon a main axis are connected by links to the two ends of a rocking lever affixed to an axis, through which passes another lever, one end of which is operated by the attendant while the other carries a wheel moving on a segmental course supported at its centre or axis so as to be capable of forming inclines in opposite directions. The ends of this course (called the balancing inclined plane) are by links connected to other levers whose opposite ends have slots to receive the crank studs from the main axis.

[Printed, 4*d*. No Drawings.]

A.D. 1860, February 17.—N° 439.

FILOPANTI, QUIRICUS. — (*Provisional protection only.*) — A series of bandages of india-rubber are wound round one or more cylinders by some costless or cheap force such as wind, the tides, a *waterfall*. The cylinders are taken to the place where the work is

to be performed, where the bandage unwinds and winds around another cylinder without tension. Both cylinders revolve and an amount of force is unfolded equal to the quantity communicated by the original mover, bating the loss from friction and other causes. To regularise the operation of charging the cylinder, it is connected with another equal cylinder on which the bandage is rolled without tension, and the cylinder to be charged is made by pinions or other means to turn round its own axis, say four times for every turn of the subsidiary cylinder. Thus the bandage is wound round at four times its natural length.

[Printed, 3*d*. No Drawings.]

A.D. 1860, February 17.—N° 445.

LAVENAS, PIERRE.—(*A communication from Louis Brunier.*)—Air is pumped into a reservoir. When a sufficient pressure is obtained the air is allowed to pass into a pipe terminating in a circular orifice partially closed by a cone having concave sides, the point being protruded through the orifice so that the air can escape only by the annular space around the cone, and in thus escaping acquires great velocity. It then passes into a tube of somewhat larger diameter placed at a little distance from the orifice and communicating with a second reservoir. By means of the velocity of the air the 2nd reservoir becomes filled with compressed air at a greater pressure than that in the first reservoir. And by a series of similar orifices and reservoirs a continual supply of compressed air is obtained, part of which is brought back to keep up the proper pressure in the 1st reservoir.

[Printed, 1*s*. 10*d*. Drawings.]

A.D. 1860, March 1.—N° 565.

DESTAS, PIERRE CHARLES DÉSIRÉ.—A wheel to be moved by wind or water is constructed with a number of wings or floats placed on the rim and resting upon a centre or stud fixed or otherwise. An eccentric fixed on the shaft pulls the wings or floats into the most favourable position for the action of the wind or water. When wind is used an apron is placed in front of the wheel up to its horizontal axis, and the whole apparatus is fixed on a turntable to bring the wheel always before the wind.

[Printed, 6*d*. Drawing.]

A.D. 1860, March 6.—N° 615.

HUGON, Pierre.—In this invention there are two or more bent tubes having one end closed by a cap on which two taps are placed, and the other end furnished with a valve submerged in a basin. A branch is attached to each tube and to one end of a machine somewhat similar to the ordinary steam engine cylinders, which is filled with water. A quantity of mixed gas and air is introduced into one of the bent tubes and exploded, and by the heat consequently generated a large quantity of water escapes from the tube by the valve, but a short time afterwards a vacuum is produced. By the motion of a valve in the branch tube attached to the cylinder a communication with it is effected and the water replaced in the tube from the cylinder. By this means the piston and main shaft may be set in motion. The gas is mixed by an apparatus composed of a beam, at each extremity of which 4 small gasholders are placed submerged in a case. In the centre and interior are 4 tubes furnished with taps by which the mixture is drawn off into a bent mixing tube, in the interior of which small plates are placed full for half their circumference, and pierced with holes the other half. They are placed so that the full part of one plate is opposite the perforated part of the other.

[Printed, 1s. Drawings.]

A.D. 1860, March 8.—N° 630.

BARTON, Moses, SHEPHERD, Josiah, and EVANS, Thomas.—(*Provisional protection only.*)—" Supplying and heat-" ing air, the same to be used as a motive power."

Air is forced into a strong iron vessel or air furnace made in the way in which steam boilers are or may be made, and is heated by fire applied internally or externally. If internally the fire is suspended in connection with a supply tube and cut-off valves that when opening the tube externally its connection with the fire internally is stopped to prevent the escape of the rarified air. If externally the furnace is supplied with a number of tubes passing through or around the interior of the furnace through which the draft of the fire passes to be gathered into a flue which may pass around and around the vessel. The escape tube may also be heated to keep up the heat of the air passing from the furnace to the cylinder. The air is forced into the furnace by the action of a number of balls which fall on and force down pistons

in small cylinders in connection with the supply valves. The balls after acting run down inclined planes and are received on the top sides of blades or worms of screws by the revolution of which they are brought to the top to roll off and fall again on the pistons.

[Printed, 4*d*. No Drawings.]

A.D. 1860, March 16.—N° 701.

HUDDART, GEORGE AUGUSTUS, and HUDDART, JOSEPH DURHAM ERSKINE.—(*Provisional protection only.*)—Motive power is obtained from centrifugal force. This is effected first by two sets of governor balls composed of equal weights on separate spindles, placed at the extremities of a vibrating beam. The balls are driven by variable gear, so that one set is accelerated while the other is retarded. The end of the beam to which the accelerated pair of balls is attached, is lifted and an oscillating motion thus obtained. Secondly, by fixing a heavy body on the end of an arm mounted on a pivot at the end of a vibrating lever. The body is made to rotate, and during one half of its orbit pulls the beam in one direction, and during the other half pulls it in the opposite. Or, thirdly, by rotating a heavy body on a pivot placed on the periphery of a wheel driven at a variable speed. The body is caused to increased in speed always at the same part of its orbit, by which a constant force in one direction will be produced on the pivot.

[Printed, 4*d*. No Drawings.]

A.D. 1860, March 28.—N° 797.

BARTHÉLEMY, CARL.—A number of iron tubes are fixed in an axle. A waterproof extensible cup is fixed at each end of the tube, and iron bars, made as much longer than the tubes as is necessary to extend one of the caps are made to work within the tubes with as little friction as possible. The machines are made to stand in water up to the axle or higher. The lower cap under the water becomes extended by the dropping of the bar and is forced up by the water, bringing its tube to a diagonal position and the next tube to an unlocker. The bar in that is then unlocked and drops extending the lower cap. The lower caps may be filled with air, gas, or vacuum, and being forced up by the water or other fluid, produce a motive power.

[Printed, 6*d*. Drawing.]

A.D. 1860, April 5.—N° 878.

HENRY, MICHAEL.—(*A communication from Henry François Cohade.*)—"The invention applies to the application of an ex-" plosive mixture, inflammable by the electric spark, to rotatory" and oscillating machines, however they may be arranged." The mixture consists of oxygen or common air, mixed with street gas or hydrogen, or carburetted hydrogen derived from distilled coal, or of the gases from the decomposition of water which may be carburetted by town pitch. Five several sorts of engines are described. In one the explosion causes the rotation of two wheels in opposite directions. These have teeth or flanges gearing into each other; or an S-like section. Another form is similar to Bois' engine, patented in France in 1842, for use with steam, and consists of a portion of a sphere with an axis having a disc corresponding in diameter with the sphere so as to divide it into two equal parts and a sliding partition subdividing into two parts, each of the halves. Each of the four parts vary in size continually as the disc revolves. To these are added a slide to regulate the admission of air and gas, and metallic packings, to regulate the rubbing parts and keep the joints tight. To make the engine works in both directions, an exit passage like those of ordinary steam engines must be added. Several modes of firing the explosive mixture by an electric spark or a platinum wire kept hot by electric apparatus are described. In other arrangements a slide is made to revolve within a cylinder, or a cylinder revolves eccentrically within a larger cylinder having a partition pressed down by a spring. A concentric casing within which a current of cold water circulates surrounds the vessel in which the gases explode.

[Printed, 1*s*. 6*d*. Drawings.]

A.D. 1860, April 13.—N° 930. (* *)

EDWARDS, THOMAS.—(*Provisional protection only.*)—"Im-" provements in obtaining motive power" by employing the continuous pressure of steam, air, gases, or fluids of any kind to act on a revolving piston within a cylinder. "This piston is" provided with two metallic packing strips forming a line of" contact with the opposite sides of the interior of the cylinder," *one of* such lines of contact being formed on the abutment side

" of the piston, and the other on the pressure or power-exerting " side of the piston. The axis or shaft of the rotatory piston is " placed eccentrically within the cylinder, and the cylinder ac- " commodates itself to the changing motions of the piston in its " revolving or circular motion. The medium or agent employed " for obtaining the requisite pressure is admitted by a suitable " divided passage cast in the shaft, each compartment communi- " cating by an opening or passage with either side of the revolving " piston."

[Printed, 4*d*. No Drawings.]

A.D. 1860, April 14.—Nº 935.

MENNONS, Marc Antoine François.—(*A communication from Jacques Belou.*)—" In engines constructed on this principle " the air being thrown by a force pump into a closed furnace is " instantaneously heated partly by contact with the ignited fuel " partly by its combination with the gaseous products of the " combustion and from thence passes into a cylinder in which it " exercises its expansive force. After their escape from the " cylinders the hot air and gases may be turned to account for " heating the air delivered by the pumps " or for heating or drying purposes.

The fuel falls on a turn plate, whose inclination is regulated by the movement and spreads evenly over the entire surface of the grate.

[Printed, 1*s*. 8*d*. Drawings.]

A.D. 1860, April 17.—Nº 961.

JOHNSON, John Henry.—(*A communication from Milton A. Whipple.*)—" Caloric engines."

In this the lower part of the working cylinder is used as a stove. The cylinder has a section or length of thinner material than the rest placed between the upper and lower portions. The piston is of a length greater than its diameter, hollow, covered in at the top and bottom, but packed at its upper end only. An air pump worked by a pulley on the main shaft forces cold air into the ash-pit. The air escapes by an escape valve which is opened by means of a lever and cam on the main shaft, and is adjusted by a spring and regulating screw.

[Printed, 8*d*. Drawing.]

A.D. 1860, April 30.—N° 1087. (* *)

GILLARD, Joseph Pierre.—(*Provisional protection only.*)—
"Improvements in apparatus for manufacturing gas for lighting
" and heating, and for obtaining motive power.

The invention consists in decomposing superheated steam by injecting it in numerous jets on to a layer of wood, charcoal, or other substance containing carbon free from sulphur, placed in a retort of a peculiar construction, composed of graphite metal or other impermeable material, lined inside and out with a coating of fire-clay. The steam, after passing through numerous passages in a block of cast iron red hot, passes to a tube provided with rose jets in fire-clay, through which it acts on the charcoal in the retorts. The gas evolved passes into a purifier so constructed that the gas rises through the lime or other purifying agent in place of descending through it. The gasometer is weighted with water in place of the ordinary weight. When "the gas is to be
" used as a portable gas and as a motive-power agent, it is com-
" pressed." The compressing apparatus consists of a cylinder to one end of which a flexible tube of caoutchouc is secured. The other end of the tube is secured to a disc or piston working loosely up and down the cylinder, and actuated by a crank and connecting rod. The compressed gas may be used as a motive power and afterwards as a heating or lighting.

[Printed, 4*d*. No Drawings.]

A.D. 1860, May 2.—N° 1104.

GEDGE, William Edward.—(*A communication from Jean Baptiste Tisserant.*)—(*Provisional protection only.*)—"Obtaining
" pneumatic power."

A pair of pumps communicate by means of a suction pipe with two receivers in which a piston works carrying a rod, which reaches to and works with a balance beam, each near its opposite extremities. The apparatus is set in motion by means of a handle which turns an axle. A certain number of strokes of one of the pistons empties one of the receivers, one of the rigid rods falls and the other rises, the balance beam working as a lever.

[Printed, 4*d*. No Drawings.]

A.D. 1860, May 4.—N° 1117. (* *)

LACOMME, Auguste.—(*Provisional protection not allowed.*)—
" An apparatus, the pneumato-liquid mover, applicable to all " branches of industry which require a first prime mover."

" This apparatus is composed as follows :—

" No. 1. A reservoir filled with any liquid whatever.

" 2. A prismatic axis; the number of sides is more or less " large according to the power that one wishes to give to the " apparatus, that is to say, it may be hexagonal, octangular, " decagon, etc.

" 3. A pivot at each extremity of the axis, which rest on cou- " sinets or vises of pression, is supported on each side of the " reservoir.

" 4. A hole on every longitudinal surface of this prismatic " axis comes to the opposed parallel surface (none of these holes " meets in the same direction).

" 5. A lever more or less long, . . . goes through each of the " holes practiced on the longitudinal surface of the axis; this " lever slides easily from one extremity to the other.

" 6. A hollow recipient in the shape of a balloon, closed her- " meticaly, filled either with air or gas, is at each extremity of " this lever.

" 7. A toothed wheel (No. 1.) is fixed at an extremity of the " prismatic axis; this wheel works into another wheel, No. 2, " with the assistance of several pinions.

" 8. Another wheel, No. 2, working with the wheel No. 1, " causes the crank No. 9 to move.

" 9. A crank moves by the wheel No. 2; it communicates to a " piston," which successively drives back near the axis the upper- most recipient of each lever at the moment of its arriving " on " the perpendicular by the rotation of the axis."

[Printed, 4*d*. No Drawings.]

A.D. 1860, May 15.—N° 1190.

SAX, Alphonse.—(*Provisional protection only.*)—Motive power is obtained from weights and springs or springs only.

Weights or springs are made to bear on three or more standards gliding in suitable bosses fixed to the frame of the vehicle or parts to be moved. The lower end of each standard is curved and jointed to a lever arm connected at the end by a joint to a spring

working in the side of the standard opposite the lever arm. Towards this end a projecting bolt is fixed for a friction roller to roll on, which glides over a projecting rim fixed against and all round the side of the wheel of the vehicle. Each wheel has a similar mechanism. A similar arrangement on the opposite side of the standard is put into operation when the motion is to be reversed.

[Printed, 4*d*. No Drawings.]

A.D. 1860, May 17.—N° 1213. (* *)

MENNONS, MARC ANTOINE FRANÇOIS.—(*A communication from Joseph Auguste Monnier and Georges Brunier.*)—(*Provisional protection only.*)—"This invention is based on an application of " the screw to the working surfaces of the cylinders and pistons " of motive engines or machinery " " actuated by steam and other " aeriform fluids." An ordinary cylinder has a spiral groove cut round its inner surface to receive a metallic screw. The piston is of helical form corresponding to the cylinder screw and its rod is threaded to the same pitch, and, after having passed through the cylinder cover and stuffing box, "is maintained in a perfectly " central position" by a tapped collar, in which it revolves, and which is fixed outside the stuffing box. The cylinder has induction ports opening into the ends, and is furnished with a valve box of the ordinary construction. "The steam admitted into the " cylinder thus constructed exerts its pressure on one of the free " surfaces of the helical piston," and imparts to it rotary motion in the direction of the "convolutions of the main screw. The " down stroke completed, the second free surface" "receives in " its turn the action of the steam, the piston revolving in the " opposite direction ascends the spiral to its starting point, and " so on alternately as in ordinary engines."

Circular motion is produced direct by the rotating piston rod and it "may be readily converted into rectilinear or other."

[Printed, 6*d*. Drawing.]

A.D. 1860, May 28.—N° 1311. (* *)

MURPHY, WILLIAM JEREMIAH.—(*Provisional protection only.*) —"An improved motive-power engine."

This engine may be driven by the elastic force of "steam " *compressed* water, compressed air, or other elastic fluid."

The cylinders are radially disposed within a steam-tight chamber which is placed to revolve on the end of a stationary feed pipe. "The cylinders are fitted with pistons and piston rods, "so that when steam or other elastic fluid is admitted to the "centre, it acts simultaneously on all the pistons, driving them "outwards. To the outer end of each piston rod is attached a "lever, which vibrates on a fulcrum, and is connected by a link "to the rim of the fly wheel in such a manner that as soon as "the pressure acts upon the pistons, the levers by their links pull "the fly wheel round, and as the cylinders and levers revolve "with the fly wheel, the force of the steam or other elastic fluid "is constantly forcing the fly wheel round in one direction as "long as the pressure is maintained."

[Printed, 4*d*. No Drawings.]

A.D. 1860, June 15.—N° 1458.

PREDAVALLE, BARTOLOMMEO.—(*Provisional protection only.*) —One extremity of an india-rubber tube is turned over and fastened all round the open end of a cylinder. To the other extremity is attached a circular frame and a little further on a plate forming a sort of air-tight piston bag or sack. The frame has a valve supported by an air-tight rod outside the cylinder. The plate has a thin vertical pipe with a stop cock, and an exhausting pump is connected with the cylinder. The vertical pipe is filled with liquid, and a vacuum made in the cylinder. The pressure of the atmosphere through the pipe will then impart a constant impulsive force to the valve and to the rod touching it. The apparatus may be applied as the piston of a steam engine to produce an alternate vertical or constant horizontal motion.

[Printed, 4*d*. No Drawings.]

A.D. 1860, June 21.—N° 1511.

STEVENSON, HENRY BUENAVENTURA. — (*Provisional protection only.*)—"Improvements in apparatus for propelling and in "other rotary apparatuses."

Two wheels revolve together in parallel planes, the centre of one wheel is above or at the side, but behind in an oblique line with that of the other. The wheels carry between them plates, boards, vanes, or other appliances, at points on each wheel equidistant from its centre and at the same distance from each other,

in one wheel as in the other. These plates or vanes are carried round with the wheels, but always remain parallel to the same plane. A cap or casing surrounds a portion of the surface of the wheels, which prevents the plates from being acted or acting on the fluid in which they are working, or serves as a chamber to receive or hold steam, water, or other fluid. Water, steam, or other motive agent may act on the plates or sails. For driving mills by wind, sails or vanes may be carried between the wheels. For rotary engines the wheel may be surrounded with a casing and steam, air, explosive gases, or fluids, admitted to act on the plates.

[Printed, 4*d*. No Drawings.]

A.D. 1860, June 30.—N° 1581.

REBOUR, Claude Joseph Napoleon.—Motive power derived from a motor characterized by a continued rupture of equilibrium.

Two cylindrical weights on solid wheels are made to rest upon two carriage wheels. When the solid wheels are in the vertical line passing through their centre of gravity, and that of the wheels on which they rest, they remain stationary, but when removed from such position, and if their axis is made to rest upon any point animated with a continual motion ever reproduced at the same point, and consequently unable to afford a rigid support, a breaking out of the equilibrium will ensue, and the wheels will produce a motion opposite to this change of the centre of gravity. To effect this the axis of the solid wheels is made to come into contact with circles placed round and moving freely round a series of balls, which themselves move freely within a circular channel made between the circles and cylindrical plates, which are in turn joined by bolts so as to form boards. The contact of the axle must not come much nearer or recede too far off the intersecting point of the vertical passing through the centre of the carriage wheels with the horizontal line through the centre of the boards. To prevent this there are provided on the guard plates arched openings into which the axes of the boards move.

[Printed, 1*s*. 6*d*. Drawings.]

A.D. 1860, June 30.—N° 1585.

COHADE, Henry François.—A mixture of air and gas is *exploded* in a chamber furnished with a valve opening from the

explosion chambers to a close vessel. The gaseous products pass into the 2nd vessel, and with this compressed air any engine suitable may be actuated.

In one modification the combustion chamber is cylindrical and furnished with a piston, above which air is admitted from a reservoir which receives the air after it has passed through the air engines. The explosive mixture is admitted below the piston, and by its explosion drives the air above the piston into a reservoir to supply the air engine. The piston descends by its own weight, and the products of combustion pass out by a valve. In another modification the piston and cylinder are made double acting by admitting the air and explosive compounds alternately at opposite ends of the cylinder.

[Printed, 1s. 2d. Drawings.]

A.D. 1860, July 10.—N° 1658.

MENNONS, Marc Antoine François.—(*A communication from Frédéric Guibé.*)—(*Provisional protection only.*)—" In this " system the cold air is forced by a pump into a strong close " recipient in which it is heated to, say, about 250° or 300° centi- " grade, and thence passes to a driving cylinder similar to that " of the ordinary steam engine."

It may be heated internally by gas or externally by fuel, which may act on an interposed bath of metal, oil, or saline solution. The feeding pump has a cold water case. The hot exhaust air is carried round the conduit of the cold air delivered by the pump.

[Printed, 4d. No Drawings.]

A.D. 1860, July 17.—N° 1729. (* *)

SPENCER, George.—(*A communication from Joseph Marks.*) This invention of apparatus used for lubricating valves and pistons of engines and other machines worked by steam, air, gas, or vapour, consists in impregnating steam or other vapour with oil, tallow, or other lubricating material in its passage to its work in the engine cylinder, valves, or otherwise. The apparatus is a hollow cylindrical case or box fixed to a convenient part of the boiler or engine: the central space in the box is divided from the end spaces by two perforated plates between which, thoroughly impregnated with lubricating material or liquid, there is a mass of suitable porous packing, such as cotton wick, worsted, sponge, or

fine wire twisted together. The steam is admitted into the lower end space, and by passing through the packing mass to the upper end space it becomes impregnated with fine lubricating particles which it carries on to the valve and cylinder. The oil and lubricating material is introduced above the packing mass through a pipe which opens into the upper space of the chamber.

[Printed, 10*d*. Drawing.]

A.D. 1860, July 20.—N° 1762.

JUMELAIS, Ange.—(*Provisional protection not allowed.*)—"Plenum" is created by bellows, stream of water, or other aspirating apparatus. The power may be used internally, when it acts by "draging with it along the tubes all divided substances, and "even water, and externally by placing in the interior of the "tube screws (*hélices*) and Archimides screws put in rapid motion "merely by the current of atmospherical air."

[Printed, 4*d*. No Drawings.]

A.D. 1860, July 26.—N° 1814.

HENRY, Michael.—(*A communication from Francis Million.*)—In this engine air is forced into a receiver from a tube furnished with a valve and passes to the bottom of the working cylinder. The tube contains near the cylinder a metal "regenerator." Air is also forced above and below the bars of a furnace and passes with the products of combustion by a flue which opens into the tube close to the regenerator and between it and the cylinder. The valve of the receiver is open during all the time of the up-stroke of the piston, so that admission and expansion may be carried on during the whole stroke. The receiver is filled with divided metal which keeps the temperature of the air uniform. During the descent of the piston a valve is opened in the tube between the receiver and the regenerator by which the air escapes. The mode of constructing and applying the heat of the furnace described, which is called "the assistant communication furnace," may be applied to Ericson's, Sterling's, and other engines worked by air or steam, or by both.

[Printed, 2*s*. 8*d*. Drawings.]

A.D. 1860, July 30.—N° 1851. (* *)

HEDLEY, Oswald Dodd.—Obtaining motive power and *evaporating* liquids by utilizing heat abstracted from the exhaust

steam of a steam engine. The exhaust steam is conveyed into a cylindrical chamber filled with air tubes, through which the atmosphere is drawn by the double action of a piston in a cylinder which at the same time acts as a force pump; back pressure valves are arranged at the top and bottom of the cylinder to open and close with the alternate upward and downward stroke of the piston, and the air then heated, following the direction of the piston, is on its return alternately driven before it into the tubes of a cylindrical boiler, where, by the repeated strokes of the piston, it is compressed, and the heat it has obtained on its passage through the tubes in the exhaust steam cylinder is concentrated and partially imparted to the water in the boiler, the residue being compressed air at a then reduced temperature passes into a receiver, and may be used for actuating a compressed air engine of any suitable form or construction. In place of working air alone, as above described, a mixture of air and steam may be similarly employed. The piston is actuated by a steam engine, and, by preference, worked by the steam generated by the steam boiler. " By thus combining machinery, atmospheric air will be heated " then compressed so as to occupy less space, and consequently, " become of higher temperature and suitable for evaporating " water or other fluids." Loss of heat by radiation is prevented by clothing the apparatus.

[Printed, 6*d*. Drawing.]

A.D. 1860, August 15.—N° 1983.

BLUZAT, Jean, RIVIÈRE, Marcelin, BLUZAT, Claude, and MAIGRON, Frederic. —(*Provisional protection only.*)— Motive power is derived from a lever machine with wheel gear which gives motion to two main levers each terminating at one end in a looped fork, and connected to two pauls, one extending above and the other below. The non-looped ends have balance weights fixed, and are themselves fixed to a toothed segmental wheel. Between the forked ends of each lever are ratchet wheels keyed on a shaft which extends on one side beyond the frame of the machine. Power is employed to turn a crank handle which, through a toothed pinion, drives a toothed wheel on the same shaft as the two toothed pinions which successively raise the toothed segmental racks on the main levers. Cams on the end of the racks come in contact with springs and provide for a continuous rise and fall of the levers. Through the pauls rotary

motion is given to the ratchet wheels and the toothed wheel on the same shaft which is connected with a wheel on the fly wheel shaft. The power to drive the crank handle is derived from the fly wheel shaft when in motion.

[Printed, 4*d*. No Drawings.]

A.D. 1860, August 28.—N° 2074. (* *)

SIEMENS, CHARLES WILLIAM.—" Improvements in engines to " be worked by the alternate expansion and contraction of steam " and other elastic fluids."

The following Specifications of Patents granted to this inventor are referred to, namely, No. 326, A.D. 1852, and No. 1363, A.D. 1856.

1st. " Constructing regenerative engines of four working cylin- " ders, closed at both ends, with intercommunications through " regenerators or respirators so arranged that the front of the first " cylinder communicates continuously with the back or heated " portion of the second, the front of the second with the back of " the third, the front of the third with the back of the fourth, and " the front of the fourth with the back or heated portion of the " first-named cylinder, and of connecting the four working pistons " of these cylinders to one rotating shaft so as to render their " motion consecutive, causing the front part of any one of the " four cylinders to act the part of charging cylinder to the back " or heated portion of the succeeding cylinder."

2nd. " Effecting the consecutive motion of four such working " pistons in attaching the same to four equidistant points of the " circumference of a disc or cross frame carrying a central radial " arm perpendicular to the plane formed by the four points of " attachment, which arm is connected to a working crank."

3rd. " Reversing regenerative engines with four working cylin- " ders " " by introducing valves into the four communicating pas- " sages, which being moved in concert reverse by one movement " the order of succession of communication between adjoining " cylinders, the supply and discharge valves of the engine being " at the same time reversed in their relative times of action."

4th. " Heating regenerative and caloric engines by the appli- " cation of jets of gas flame, which gas may be conveniently " produced by the imperfect combustion of solid fuel in a sepa- " rate furnace or gas generator, and the utilizing of waste heat " of the products of combustion in heating the air to support " combustion."

5th. "Imparting heat to the gases which constitute the working "medium of regenerative or caloric engines by introducing "amongst them, at such time when they are heated to the "utmost extent, by means of respirators or regenerators, highly "heated currents of steam or air, or the heated products of com- "bustion produced by igniting a mixture of air and inflammable "gas compressed and fired before reaching the cylinder."

6th. "Combining the two methods of internal or external "heating in regenerative or caloric engines."

7th. "Firing a mixture of inflammable gases or vapours and "atmospheric air before entering the heated chamber or cylinder "of regenerative or caloric engines, by passing the same through "a pipe or chamber with recesses presenting highly heated or "incandescent surfaces."

8th. "Cooling the working cylinder or working cylinders of "regenerative or caloric engines by causing a current of atmo- "spheric air to pass through the same at the completion of each "effective stroke."

9th. "Combining the heating and cooling arrangements of the "working cylinders of regenerative and caloric engines."

10th. "Generating inflammable gases for heating regenerative "or caloric engines by placing fuel in an upright receptacle, and "by introducing amongst it jets of atmospheric air from without "at a certain elevation, so as to produce a zone or intermediate "layer of highly incandescent fuel, which on being traversed by "the raw products of distillation from the fresh fuel supplied "above, as well as by steam or other vapours which may be "introduced, will convert the same into permanently elastic com- "bustible gases, such as hydrogen and carbonic oxide."

11th. "Utilizing the sensible heat of the inflammable gases "produced in the above-named apparatus by transferring the "same either to atmospheric air supporting the subsequent com- "bustion of those gases or to water, the vapours from which may "be used with advantage in the same apparatus, in order to be "also converted into inflammable gas."

[Printed, 1s. 10d. Drawings.]

A.D. 1860, August 31.—N° 2110.

NEWTON, William Edward.—(*A communication from John Ericsson.*)—"Improvements in air engines."

Two cylinders are placed in a direct line. close to these is a strong vessel to which heat is applied and also another vessel

kept cool by the application of cold water or currents of atmospheric air. Within each of the cylinders a hollow piston is made to operate and both pistons are connected by a long piston of relatively small diameter resembling the ram of a hydraulic press. Both ends of one cylinder are simultaneously in free communication with the heater whilst both ends of the other "cylinder are at the same time in free communication " with the cooler. The pressure in the heater being greater " than in the cooler, the long or working piston will be forced " from the cylinder, which is in communication with the heater " into the cylinder communicating with the cooler. When the " working piston has completed the stroke the communication " between the cylinders and the heater and cooler are reversed " by valves operated as in non-expansive steam engines, and " thus a continuous motion is produced."

The hot and cold air escaping from the cylinder is made to pass through a chamber filled with wire cloth, or through metallic tubes into the cooler or heater respectively. The greater column of air withdrawn from the heater that which is returned is compensated by the dilation caused by heating the air in its passage through the heaters. The diameter of the acting pressure towards the end of the stroke is obviated and the pressure may be augmented by these improvements.

[Printed, 6*d*. Drawing.]

A.D. 1860, September 1.—N° 2115.

BOWLER, John Cobb.—(*Provisional protection only.*)—Motive power is obtained from a combination of levers with their fulcrums adjusted in or about their centres, so that they revolve when first set in motion by the power of gravitation. The power to set the levers in motion is derived from steam, air, water, or any elastic or solid substance which gives an upward or downward pressure to the levers and keeps them in motion while the weight or power is stationary.

[Printed, 4*d*. No Drawings.]

A.D. 1860, September 22.—N° 2317. (* *)

BUDDEN, John Leggett.—(*A communication from Woodford Pilkington.*)—This invention consists in obtaining motive power by the application of steam, highly rarefied gas, or other aeriform fluid. It is described as applied to the screw propeller of a vessel

but is stated to be applicable as a motive power to general purposes. A screw propeller, by preference double threaded (on the Archimedean principle) is mounted upon a hollow shaft, in the usual position in the dead wood of the vessel. A cavity is formed in the boss of the propeller, wherefrom, issuing at the periphery, are formed a number of curved radiating passages arranged according to the constructive principle of the turbine wheel. There are two distinct sets of radiating passages, which curve in opposite directions for the double purpose respectively of going ahead and backing astern. A high-pressure boiler is disposed in the after hold of the ship. A steam pipe leads from the stop valve case on the top of the boiler, down to the end of the propeller shaft, through the hollow of which it communicates with the cavity in the boss of the propeller, opening a passage thereto from the steam space of the boiler. Within the cavity there is a piston valve, which by means of a rod attached thereto is caused to slide when getting under weigh, and uncover either one or other set of passages according to the order for going ahead or astern. The other end of the rod is passed through the shaft into the vessel, where by means of suitable connections it is operated by the attendant. The propeller is driven round by the action of the steam upon the water, and the reaction of the water upon the steam, which of course must be instantaneous before condensation weakens the force of the steam.

[Printed, 10*d*. Drawing.]

A.D. 1860, October 13.—N° 2494. (* *)

RESTON, SAMUEL.—(*Provisional protection only.*)—" A rotary " engine for obtaining motive power by the agency of steam, " heated air, or other fluid." A cylindrical shell is fixed on a central shaft by means of a spiral partition, one edge of which is attached to the shaft and the other edge to the shell, whereby a spiral passage is formed through the apparatus. Two or more spiral partitions are sometimes fixed within the cylinder, which then form distinct spiral passages of a coarser pitch. The shaft and apparatus are made to rotate with great velocity by the admission of steam at one end of the cylinder, which, after passing through the spiral passages, may be made to enter a second cylinder, and so on until its force is completely exhausted.

[Printed, 4*d*. No Drawings.]

A.D. 1860, November 7.—N° 2743.

NEWTON, William Edward.—(*A communication from George Marshall.*)—" Obtaining motive power from air."

This is done by a number of tanks provided with an internal heating apparatus, and successively filled with compressed air. The heating apparatus consists of a burner, from which hydrogen gas under pressure escapes, and is ignited by means of an electric spark. Oxygen gas may be supplied to increase the intensity of the flame. The heated compressed air is conducted to the cylinder of a high pressure engine. " It will be found convenient " to use the heated compressed air from two or more tanks in " combination, so that the pressure may be equalized."

[Printed, 8*d.* Drawing.]

A.D. 1860, November 13.—N° 2779.

WILLIAMS, Joshua.—(*Provisional protection only.*)—Motive power is to be obtained by sinking a shaft, " at the bottom of " which are to run horizontally a series of circular tunnels." The air in these is compressed by the entrance of water, which is supplied by an iron pipe from a spring. Other pipes convey the compressed air to any place where the power is required, or elastic air bags may be used. The tunnels are emptied of water by again forcing air down.

[Printed, 4*d.* No Drawings.]

A.D. 1860, November 26.—N° 2902.

HUGON, Pierre.—(*Provisional protection only.*)—This invention consists of an improved mode of igniting " explosive gaseous " compounds" used in the engine, No, 615, A.D. 1860. "The " gas is admitted at stated intervals into a chamber through a " pipe provided with two or more orificies," and "impinges " against two platina wire plates, and is ignited by a jet of gas " kept constantly burning." The wire plates become red hot, " and in combination with the gas cause the explosion of the " mixture."

[Printed, 4*d.* No Drawings.]

A.D. 1860, November 29.—N° 2928.

BETHUNE, Sir John Trotter.—(*Provisional protection only.*) *To each extremity* of a balance beam mounted on a strong pedes-

tal is suspended a metallic recipient, of which the bottom is pierced with a circular opening, over which is adapted the upper end of a metallic cylinder having at its lower extremity a piston with a circular slide valve. The pistons work in a pump body, from which an escape pipe with eduction valves passes to a driving wheel mounted apart on cast pillars, and surrounded by a metallic circle enclosing the pallets. A return pipe leads from this wheel to a fixed reservoir, whence the liquid working in the machine is distributed to the suspended recipients. The apparatus is charged with water, mercury, or other liquid, one piston being at the top of its pump body with its valve closed, the other at the bottom of the other pump with the valve open. On opening the communication with the escape pipes, the raised piston descends by the weight of the recipient, forcing the liquid below into the driving wheel, while the recipient and piston at the other end rise. The slide valves are then reversed, and the reverse movement takes place.

[Printed, *4d.* No Drawings.]

A.D. 1860, December 7.—N° 2999.

EDWARDS, Frederic Howorth.—This invention consists of a cylinder the lower part of which is heated by a furnace and the upper cooled by water contained in a surrounding chamber or water space. A piston or plunger, occupying about one half of the internal capacity of the cylinder is fitted loosely within it. The plunger is encircled by a belt of a fine wire to absorb the heat of the ascending body of air, and to impart heat to the descending body of air. When the plunger is at the top of the cylinder the pressure of the air is increased, and part of it flows through a valve at the top of the cylinder to a reservoir. On depressing the plunger the pressure is reduced and air is then allowed to flow in through a second valve at the top of the cylinder. This air is obtained from a reservoir of compressed air at a lower pressure than the air in the first reservoir. The air will pass into the higher pressure reservoir nearly cold, and, after actuating the piston of a motive power engine, is returned to the lower pressure reservoir.

[Printed, *10d.* Drawing.]

A.D. 1860, December 8.—N° 3016.

SIMON, Louis.—This consists of a hot air engine with a cylinder and two pistons. The cylinder is open at one end, and the

other end receives a dome or vessel which is heated by means of a fire. When the pistons move towards the dome a ring closes the grooves on the inner or feeding piston, and the hot air escapes by the valve placed just outside the dome. "This "piston has a quicker motion than that of the" outer or "work- "ing piston, thus causing a vacuum, and air is admitted by the "valves of the working piston into the inside of the cylinder. "If the motion is in the other direction the valves close, the "feeding piston goes quicker and presses upon the air between "both pistons, the air passing through the grooves of the feeding "piston into the space between the piston and the dome."

[Printed, 10*d*. Drawing.]

1861.

A.D. 1861, January 3.—N° 14. (* *)

FULLER, WILLIAM COLES, JAQUES, JAMES ARCHIBALD, and FANSHAWE, JOHN AMERICUS.—This invention relates to valves of steam, water, air, and gas, and other engines, pump buckets, packings, &c., and consists in adapting to such and other uses, a compound called by the inventors "junction rubber," composed of vulcanite or hard india-rubber united with soft vulcanized india-rubber during the process of vulcanizing. For stop valves the hard rubber is faced with soft material, such being either moulded to the required form or cut out of "junction "rubber" prepared in sheets for that purpose. When the two materials are united otherwise than by layers or sheets, scarf joints are preferred as giving greater holding surface, the hard vulcanite being introduced to form the part where strength and rigidity is necessary, and the soft vulcanized for the pliant or elastic part; in cases where the pressure is very great, the valve may be strengthened by a thin layer of the vulcanite. Packings for piston rods are made in soft rubber rings lined with vulcanite; also packings for screw-propeller shafts of the "junction rubber" are so accurately fitted, that the gland may be removed at any time. Rings for hydraulic rams are moulded to the required shape, and sockets or tubing are made for steam and other engines, apparatus or uses, either hard or soft, inside or outside,

to suit the required purpose. "Junction rubber" is also used for the sockets and tubing for steam, water, air, or gas engines.

[Printed, 8*d*. Drawing.]

A.D. 1861, January 3.—N° 17.

NEWTON, ALFRED VINCENT.—(*A communication from John Cleves Symmes.*)—" At each end of the cylinder containing the " working piston is a cylinder of larger diameter and in each end " cylinder a piston is fitted." These pistons are connected so as to work simultaneously. The end cylinders are surrounded at their extremities nearest the working cylinder by coils of metal tubes heated with the "burnt air" of a furnace, and at their outer extremities by similar coils cooled by streams of cold water. By the motion of the end pistons the air in one cylinder is forced from the hot to the cold side of the cylinder through a metal regenerator made of wires laid in any parallel direction, while the reverse action takes place in the opposite cylinder. The working piston is actuated by the difference of pressure.

[Printed, 10*d*. Drawing.]

A.D. 1861, January 14.—N° 107. (* *)

JOHNSON, JOHN HENRY. — (*A communication Jean Joseph Etienne Lenoir.*)—This invention relates to certain improvements upon the reciprocating gas motive power engine, described in No. 335, A.D. 1860.

A peculiar arrangement of distributing valve is adopted for effecting the admission of the air and gas into the cylinder in regular layers or strata. In addition to the air it is proposed to admit a certain amount of low-pressure steam or moist vapour, or fine spray of water into the cylinder, so that on the ignition of the gas the steam or vapour, or spray, will be heated and considerably expanded, thereby increasing the effect of the engine. The cylinder is surrounded with a cold water jacket, and the covers are also made hollow and filled with cold water.

There are two electric igniters, one at each end of the cylinder; the two wires forming one igniter, and required to produce the spark, are placed in a porcelain or other suitable non-conducting rod, which is fixed inside a metal plug screwed into the cylinder cover. A metal slide carried by the cross-head of the piston rod makes electrical contact with certain insulated plates that are

respectively connected with the igniters, so that the circuit is made, and a spark is produced in each end of the cylinder alternately, so as to explode the gas and air which have been drawn or sucked in by the piston at the commencement of its stroke when under the influence only of the fly wheel. The electric force required to produce the spark is preferably obtained from Ruhmkoff's coil.

[Printed, 1*s*. Drawing.]

A.D. 1861, January 17.—N° 134.

CAVALERIE, Marcelin François.—(*Provisional protection only.*)—Motive power is derived from a balance lever formed of twin plates united by a bottom cylinder in which is placed the rotating axis of the lever. At the extremities of the lever between the plates are pivotted small shafts carrying a lever bent at right angles, the extremity of which is weighted. The small shafts and the axis of the lever terminate in cranks all attached to a common connecting rod. The crank on the axis of the balance lever also carries a rod connected to a crank on the fly wheel shaft, which crank is governed by another rod connecting one end of the balance lever. One of the rods imparts a movement of rotation to the cranks of the balance lever and weights, and the second connecting rod imparts an alternating movement of rotation to the balance lever, which combined action produces the motive power.

[Printed, 4*d*. No Drawings.]

A.D. 1861, January 17.—N° 137.

HENRY, Michael.—(*A communication from José Gallegos.*)—Improvements in apparatus for locomotion.

The means employed for obtaining and controlling the locomotion of the carriage are: — First, apparatus to apply the muscular power of a man acting as a motor for guiding, steering, backing, and stopping the carriage, and causing it to surmount obstructions. Secondly, employing the weight of a man acting as motor and conductor by placing him in a vertical position sufficiently unsteady for his weight to oscillate and produce power applicable to treadles, pedals, or levers. Thirdly, the weight of men on a seat placed on the top of a triangular piece, reversed *pendulum*, or rocking appliance, on a centre or axis, such weight

falling on the treadles or levers. Fourthly, arrangements whereby a man as a motor bears vertically and alternately on two treadles or levers. Fifthly, obtaining power by the oscillation of mercury. As a propulsive agent applied with these arrangements a compressed air or caloric engine or air expanded by electricity (as Lenoir's plan) is sometimes employed. The mechanical arrangements do not increase or produce power by themselves, but are a powerful help to locomotion or auxiliary agency being combined so as to transmit power from one point to another so as to gain in speed what is lost in velocity or vice versa, or to change the direction of the motion.

[Printed, 1*s*. 2*d*. Drawings.]

A.D. 1861, January 21.—N° 166.

PASCAL, Jean Baptiste.—This consists in the application to explosive engines of inflammable gas produced by the decomposition of steam made to pass through incandescent coal. The fuel is contained in a furnace surrounded by a casing containing water from which steam is drawn at intervals through the furnace by the aspiration of a gasometer, or by a blowing machine. The inflammable gases produced are hydrogen and oxide of carbon. By passing air through the incandescent coal, oxide of carbon mixed with azote is produced. When hydrogen and oxide of carbon are produced, the mixture is very inflammable and may be ignited by electricity, but when oxide of carbon is produced alone the mixture is little inflammable, and in order to light it, a current of the very inflammable mixture is used. An incandescent platinum wire may also be used to ignite all the mixtures "where the inflammation takes place during the introduction of "the said gases, and as long as the introduction lasts." The wire may also be brought into contact with the gases instantly at the desired times by means of a slide valve. The gases may be applied to dilated gas or vapour engines such as Ericsson's, or explosive mixture motors may be combined with dilated gas engines by introducing at the beginning of the piston stroke, a certain quantity of inflammable gas which is inflamed and afterwards in the same cylinder during the continuance of the stroke, introducing motive gases which set themselves in equilibrium of elasticity with the inflammable gases precedently introduced. Two capacities with calorifugal sides communicate with the cylinder, the base of which they constitute on each side. Into

these capacities the explosive gases pass to be inflamed. They may be provided with two orifices, one for the inflammable, and the other for the little inflammable gases. The piston is provided with displacing bodies, which fill up the capacities for the purpose of avoiding detrimental spaces and preventing the side surfaces of the cylinder from being in contact with the hot motive gases.

[Printed, 1*s*. Drawings.]

A.D. 1861, January 26.—N° 212. (* *)

JOHNSON, John Henry.—(*A communication from Auguste Prouvost.*)—This invention relates to obtaining motive power from the expansion and compression of air, gas, or vapour, and to the "pyrometer" engine, or apparatus for reworking such fluids or vapours indefinitely without loss or escape, and particularly by their regeneration after producing their dynamic effect. The "double pyrometer," worked by both air and steam, regenerates the caloric and the molecules; it consists of two working cylinders with supplemental chambers or lungs, a superheating generating apparatus, a saturating regenerating apparatus, and a refrigerating apparatus. The "superheating "generator" consists of a serpentine pipe, coiled round and embedded during the process of casting within the sides of a cast iron furnace, which is surmounted with a vertical tubular chamber or steam generator, through which the flaming gases rise from the furnace fire. The saturator, which also acts as a regenerator, consists of a horizontal cylindrical chamber, covered at one end by a cap, which affords communication to the series of pipes within; these pipes are closed at their lower ends. After the steam is expanded, it is forced back into this chamber, where it is saturated and the caloric concentrated, "the compressed air "being heated in the tubes by depriving the steam of its caloric "in order to exert its expansive force in the air cylinder." "The refrigerator or cooling apparatus is surmounted with a "chimney, and it is also formed of tubes open at both ends, "through which the atmospheric air passes, and carries off and "disperses the caloric of the compressed air contained in the "interior of the case, to serve as the counter pressure of the same "air cylinder." The two working cylinders are furnished with four "lung" chambers; they are "for the purpose of effecting "*repercussive* reactions at each stroke of the piston by means of

" the two reservoirs of different pressures and temperatures. " although of the same density, the one acting so as to equalize " the pressure, the temperature, and the density in the 'lungs' " during two strokes of the piston, whilst the other acts so as to " produce the same effect during the negative stroke; expansion " or the positive stroke takes place during the opening of the " orifice, which places the 'lungs' in communication with the " cylinder, whilst the negative stroke takes place only when the " orifice is shut." The working cylinders of the double pyrometer are horizontally disposed lineable with each other, so that the two pistons are fitted on one piston rod, which by means of a connecting rod gives motion to a crank shaft in the usual manner. The pyrometers are constructed with one, two, or more cylinders.

[Printed, 2*s*. 8*d*. Drawings.]

A.D. 1861, February 11.—N° 338.

MENNONS, MARC ANTOINE FRANÇOIS.—(*A communication from Auguste Casimir Lehot.*)—"Heating and cooling surfaces " of engines propelled by aeriform fluids."

A more rapid diffusion of caloric is obtained by securing metallic gauze or web to the heating or cooling surfaces in such a position as to be constantly in contact with the aeriform fluid or with the liquid to be vaporised. In locomotive engines the boiler tubes are surrounded by metallic gauze wrapped over itself in spiral layers. In other boilers webs are set along the inner surfaces.

[Printed, 4*d*. No Drawings.]

A.D. 1861, March 28.—N° 771.

BRITTAIN, BARTHOLOMEW.—(*Provisional protection only.*)—A rod supporting any number of "volants or flyers" and supported at both ends is placed within a tube from which the air is exhausted. The exhaust will cause the flyers to whirl round and the axle to rotate. Power may also be obtained by forcing air through the cylinder.

[Printed, 4*d*. No Drawings.]

A.D. 1861, April 15.—N° 922

SMITH, JAMES, and CHEASE, SYDNEY ARTHUR.—(*Provisional protection not allowed.*)—This relates to improvements to be used

in the construction of the "atomic engine," No. 1858, A.D. 1858. Two or more primary cylinders fitted with pistons and communicating by a pipe are attached to the engines. The connecting rods are united at right angles on the wheel by levers on which weights may be fixed. As the wheel rotates the pistons are moved in opposite directions by means of a friction wheel and the communication pipe. Each cylinder is partly filled with air, water, mercury, or essential oils. A secondary cylinder having its ends communicating by a pipe with a stop-cock and filled with water or essential oils regulates the action of the wheel by means of the connecting rod of its piston.

[Printed, 4*d*. No Drawings.]

A.D. 1861, April 19.—N° 975.

GJERS, JOHN.—(*Letters Patent void for want of Final Specification.*)—A cylinder with a working piston communicates at each end with a closed air vessel fitted with metal tubes. Each set of tubes communicates with the flue of a furnace and with a common chimney placed midway between the two vessels and provided with a reversible damper valve, which allows the hot air from the furnace to pass through the tubes in one air vessel direct to the chimney and at the same time allows cold air from the atmosphere to enter by a nozzle and pass down the tubes of the other air vessel. The same body of air on opposite sides of the piston is thus alternately heated and cooled.

[Printed, 4*d*. No Drawings.]

A.D. 1861, May 1.—N° 1090.

LÜDEKE, JOHANN ERNST FRIEDRICH.—(*Provisional protection only.*)—Motive power is derived from the peculiar property discovered by the inventor, of fluids in repelling bodies in the form of plates or discs, causing the bodies to emerge from or rise in the fluid with a force which increases with the increase of the superficial area of the plates or discs. Mercury produces the best results. Two or more thin plates, discs, or sheets are placed together so as to form one surface of two or more times the thickness of each separate plate, disc, or sheet. These are immersed and then separated so as to offer two or three times the area and rise with a correspondingly increased force. Caoutchouc may also be used, being immersed in a contracted state and then stretched.

Two sets of such plates, discs, or sheets may be used, one set immerging while the other emerges.

[Printed, 4d. No Drawings.]

A.D. 1861, May 2.—Nº 1105. (* *)

BROWN, JOSEPH GEORGE.—(*Provisional protection only.*)— A wheel is employed having cells or buckets fixed on its periphery; the axle of the wheel lies horizontally on bearings and carries a pulley, round which a belt passes, which also passes round another pulley on an axle lying horizontally above the wheel. "Both axles are provided with a pulley, round which a "belt or chain is passed carrying buckets or elevators, which are "so arranged that the outer lips of the buckets or elevators pass "close to the bottom of a trough lying under the lowest axle, "and as the elevators pass through the trough they scoop up a "quantity of shot, which they carry to the top of the highest axle "and shoot it into a trough which is so placed that the shot rolls "from the trough into the buckets or cells of the wheel at the "centre of its circumference, by which means the wheel is caused "to revolve. There is a slide in the trough by means of which the "quantity of shot delivered on to the wheel is regulated. . . . "In lieu of shot I sometimes use sand or water for the elevators "to raise up and to conduct on to the periphery of the wheel in "the manner above mentioned."

[Printed, 4d. No Drawings.]

A.D. 1861, May 13.—Nº 1210.

CHARDEMITE, PIERRE. — (*Provisional protection only.*) — "Wind motive-power engine."

To the upper part of a vertical shaft are set two wooden frames with eight arms. The frames are connected by masts or poles which are furnished with sails free to move according to the direction of the wind, and worked by halyards placed over a series of pulleys conducting them to the vertical shaft. The halyards are ultimately fastened to a wheel on the shaft to which a brake may be applied.

[Printed, 4d. No Drawings.]

A.D. 1861, May 14.—Nº 1224. (* *)

BOUTET, THOMAS CHARLES.—(*Provisional protection only.*)— "Improvements in obtaining and applying motive power by aero-"hydraulic means."

"The apparatus consists of a certain number of impervious air "chambers fixed on a movable axis in the centre of a tank full "of water. The air chambers communicate with each other by "means of tubes, which allow the air to circulate when the "fastenings fixed to the tubes or air chambers are open. Sup- "pose, for example, only two air chambers of the same size fixed "vertically upon an horizontal and movable axis; the air "chamber which is at the bottom of the water is full of air "while the one on the surface is empty. If the fastening is "opened the air pressed by the body of water remounts im- "mediately from the lower into the upper air chamber, and lifts "up a piston rod with a force in proportion to the size, or rather "to the surface of the air chamber. The piston rod, upon the "axis of which is fixed a fly wheel, transmits the motion to the "axis from the tank either by means of toothed wheels or galls, "chains, or a connecting rod with an excentric, so that every "turn of the piston forces down the chamber filled with air to "the bottom of the tank, whilst the other ascends, and so on in "succession, and thus a continual motion is obtained."—"The "fastenings are opened and shut successively by the motion of "the apparatus, by means of pins or projections fixed in the "inside of the tank."

[Printed, 4*d*. No Drawings.]

A.D. 1861, June 26.—N° 1633.

MENNONS, MARC ANTOINE FRANÇOIS.—(*A communication from Nicolas de Telescheff.*)—The invention consists of a ventilating apparatus which throws cold air into the body of the engine; a furnace composed of a metallic cylinder with a horizontal grate carrying the fuel and vertical grated appertures for the passage of the air; a turbine on a horizontal shaft driven by the dilated air mingled with the products of combustion: and a regenerating apparatus by which the cold air is heated and the temperature of the hot air escaping from the turbine reduced with connecting rods, cranks, and other ordinary mechanical accessories.

[Printed, 1*s*. Drawings.]

A.D. 1861, June 27.—N° 1647.

DOUGHTY, JOHN.—(*Provisional protection only.*)—A motive *power wheel* is divided into sections by channels or grooves in

which are metal slides actuated by toothed wheels and screws, and is provided with two semicircles near its centre one with teeth within and the other with teeth around the periphery so that when each slide leaves its vertical position it commences to project from the edge of the wheel, when it falls by its weight into a horizontal position and the weight of the next slide carrying it past, it then commences to return until it again becomes vertical, by which time it is returned within the periphery of the wheel neither end projecting, and so on with each succeeding slide, thus imparting a continuous motion.

[Printed, 4d. No Drawings.]

A.D. 1861, July 4.—N° 1702. (* *)

NEWTON, William Edward.—(*A communication from Robert Rogers.*)—This invention for obtaining motive power by the elastic force of steam and air combined, consists in the mode of effecting a commingling of the air possessing only the ordinary atmospheric the pressure, with steam out of a boiler under pressure. Hitherto the operation has been performed by the interposition of an air pump, which absorbs a certain per-centage of the power of the engine. By this invention the force of the current of steam on its passage from the boiler to the engine is made to drag with it the required quantity of air. Within a chamber or aspirator closed by a flap valve opening inwards, the steam pipe from the boiler terminates in a tapering nozzle, which points into the mouth of the receiving or steam pipe leading to the engine; the distance between the nozzle and the mouth must be slight, but sufficient for the passage of air. When the steam is turned on, it passes from the nozzle into the mouth of the receiving pipe, with such velocity as to draw with it out of the aspirator a large amount of air; the commingling of the air and steam takes place while the mixed current is coursing on to the engine. The flap valve does not control the quantity of air supplied to the aspirator, it only operates to check a back pressure of steam when, from any cause, the speed of the engine diminishes. Air may be superadded to the quantity already taken up by the steam, by the use of flap valves, opening inwards, attached to each end of the cylinder, and by so timing the slide valve, that the induction port shall remain closed until the momentum of the fly-wheel or machinery has carried the piston a short distance on its return

course; the vacuum thereby formed in the end of the cylinder draws in the air, which ceases the moment steam is admitted and closes the valve. Air may be advantageously mingled with steam for sounding steam whistles.

[Printed, 10*d*. Drawing.]

A.D. 1861, July 17.—N° 1794. (* *)

HARNETT, Andrew William.—(*Provisional protection only.*) —" Improvements in the construction of steam engines, air " engines, and pumps." " The inner surface of the cylinder " and the outer surface of the piston and piston rod, all or either " to be so formed by any mode of rifling, as to cause to be im- " parted to the piston a spiral movement when in motion."

[Printed, 4*d*. No Drawings.]

A.D. 1861, July 19.—N° 1818.

SHAW, Philander.—Hot air engines having two single acting cylinders placed on each side of a furnace and partly within an air-tight casing. Pistons work in the upper part of the cylinders only. They have at their upper surface a pipe or trunk open at the top which passes through the head of the cylinder where it is packed with leather. The cold air between the trunk and the cylinder is during the ascent of the piston forced into a pipe opening at the head of the cylinder, and is conducted through a series of tubes warmed by external contact with the hot air, and finally admitted to the furnace. The hot air and products of combustion pass into a pipe, and when the inlet valve is opened pass into the cylinder and force the piston upwards. The cold compressed air can be admitted into the cylinder below the piston by an auxiliary valve opening from the pipe conducting the cold air to the heated tubes. This valve is made to open a little before the inlet valve. The cylinder is furnished with a groove where the lower edge of the packed part of the piston comes at its lowest point in its stroke. This groove receives the lubricating fluid which escapes past the packed portion of the piston. It may also be furnished by an oil trough isolated and kept cool by the cold air from the auxiliary valve passing all round it. In this way the piston can be packed tightly and kept well lubricated.

[Printed, 1*s*. 2*d*. Drawings.]

A.D. 1861, July 22.—N° 1840.

NEWTON, William Edward. — (*A communication from Francisque Million.*)—This engine has two pumps, whose rods are connected by crossheads to a recoil rod on the working piston, one of which compresses common air, the other inflammable gases produced in a gas generator, attached to the engine. The stream of air and gas are conducted to a mixer and thence to the double-acting motive cylinder in which they are exploded by electricity. The cylinder is cooled by a cold water jacket or by the injection of cold water. The gas may also by a modification of the engine be made to enter "the cylinder in jets of flames and the engine "would work in the same manner as ordinary air engines."

[Printed, 1*s*. Drawing.]

A.D. 1861, August 8.—N° 1969.

MAILLARD, Nicholas Doran Proby. — Motive power is obtained from self-acting hydraulic and atmospheric engines, which consist of two or more metal receivers, having loaded pistons worked by long levers resting on suitable bearings. The piston of one receiver is raised, and the receiver charged with air or other fluid which is forced by the descent of the piston into one end of the working cylinder. The falling piston is made by the aid of the lever of the rising piston to raise it, and thus to draw the air or fluid from the working cylinder. The receivers thus act alternately as force and suction pumps. To prevent the loaded pistons balancing each other, two or more auxiliary or monkey cylinder and pistons, which act as lifts, and are worked by the pressure from the charged receiver, or a semicircular pendulum worked from or on an eccentric are used. The pistons of the lifts or pendulums are attached to the extreme ends of the levers of the loaded pistons. The pendulum brings its weight to bear on the lever of the rising piston, until it has passed the line or point at which the pistons would balance themselves.

[Printed, 8*d*. Drawing.]

A.D. 1861, September 7.—N° 2236.

TAYLOR, Ephraim.—(*Provisional protection only.*)—Employs a number of weights on a shaft or eccentric and a wheel which revolves and changes the position of the weights. It has bowls

on which the weights slide so that as their position is changed they gain their leverage and give effect to the wheel which is started, stopped, or governed by changing the position of the shaft or eccentric.

[Printed, 4*d*. No Drawings.]

A.D. 1861, September 9.—N° 2247.

DOWELL, WILLIAM, and DOWELL, JAMES.—(*Provisional protection only.*)—This consists of a wheel having an even number of spokes each diametrically opposite another. Each spoke carries a weight and a rod prolonged in the direction of the spoke carries a second. The two weights are connected by a set of levers whose action resembles lazy-tongs levers. When the spoke is vertically over the axle the inner weight descends and thus forces the outer weights to its highest point which is again drawn upwards by the inner weight when vertically below the axle. The weights on the descending side of the wheel are thus always at a greater distance from the centre than those on the ascending side and the wheel is thus made constantly to rotate.

[Printed, 4*d*. No Drawings.]

A.D. 1861, September 13.—N° 2278.

FELL, RICHARD.—(*Provisional protection only.*)—" Compressing " and rarefying atmospheric air to obtain a motive power, part " of which is applicable for cooking purposes."

For " the propulsion of vessels " " over a furnace I place an " air chamber " " and between it and the furnace I mount a series " of tubes provided with inlet and outlet valves " and " free to " revolve on a central shaft. A cold water cistern is placed under " the furnace through which the aforesaid tubes pass as they " revolve. As the tubes descend a partial vacuum is obtained in " them, but as they ascend the air contained in them is expanded " and admitted into the air chamber over the furnace where it " becomes compressed. When great power is required I employ " another vessel containing cold water and filled with " " air-tight " condensers." " A coiled pipe " leads " the air from the air " chamber over the furnace into the condensers, whereby the " water contained therein is forced and made to act in the driving " cylinders " which " contain collapsing pistons opening to the " external water." " As the piston becomes expanded it draws

"in with it the external water and in collapsing forces the water "back again and thus the vessel is propelled."

[Printed, 4*d*. No Drawings.]

A.D. 1861, October 2.—N° 2455. (* *)

DAVIS, JAMES, and EVANS, THOMAS.—This invention relates to the construction of engines to be worked by steam, air, or gases with oscillating cylinders, and consists of peculiar forms and arrangements of valves, which are operated by the oscillations of the cylinder, and in the mechanism by which these valves are regulated. Two kinds of valves are used; the one in common use is an ordinary slide valve fitted within one of the trunnions; it is operated as the cylinder oscillates by means of a bowl upon the valve spindle working in a fixed guide. The other proposed for use is a fixed circular valve; the ports are so arranged that while one port is over a corresponding port in the cylinder the other is upon the blank face of the valve surface, and "vice versa;" a sunken portion of the valve face places the exhaust in communication with each steam port. Reversing gear is arranged to each description of valve.

[Printed 8*d*. Drawing.]

A.D. 1861, October 2.—N° 2457. (* *)

COFFEY, JOHN AMBROSE.—(*Provisional protection only.*)—This invention, relating to engines for obtaining rotary motive power, consists of a central hollow axis from which radiate a number of pipes; the outer ends of these pipes are suitably furnished so as to open at their extreme ends, all in one direction at about right angles with the radial line; these ends abut against, and work air-tight within the inner surface of an "annulus" concentrically fixed on the same plane as the radial pipes. When steam, air, gas, or other fluid is admitted to the central axis, it diverges respectively through the radial pipes to their furnished ends, where it strikes at an angle against the "fixed annulus," and so acts by repression upon the ends of the pipes, as to cause the axis, which is suitably stepped and supported, to revolve. The invention may be modified by causing the "annulus" to revolve round a suitably fixed circumposed series of pipes, also, instead of the steam or fluid being admitted

at the centre, it may act from the "annulus," in which case only the extreme angular ends of the pipes need be hollow.

[Printed, 4*d*. No Drawings.]

A.D. 1861, October 17.—N° 2589. (* *)

MERRITT, THOMAS EDWARD.—This invention relates to a description of engines to be worked either by the action of steam, gas, air, &c., in which reciprocating motion is given to the cylinder whilst the piston remains a fixture. Within the piston rod there are two longitudinal passages which open at opposite sides of the piston; these passages communicate externally with an ordinary slide box and valve. The cylinder, which gives off the motion, works between slides; the central length which works upon the piston is of small diameter, whilst a large area denotative of the power, is given internally to the cylinder ends which expand in conformity therewith. The action may be either vertical, horizontal, or at an oblique angle. The cylinder may be enclosed in a steam jacket, supplied with fresh steam from the boiler or by the exhaust steam.

[Printed, 10*d*. Drawing.]

A.D. 1861, October 18.—N° 2599.

STREATHER, WILLIAM.—"Wind engines." The shutters or flaps are made perpendicular to the back or whip, and are opened or shut by a light rod connected to the rod that passes through the wind shaft. The latter rod is pulled further in by means of a weighted bell-crank lever to which is secured one end of an upright rod, attached to and working at the side of the upright or moveable shaft surrounding the centre or downright shaft. The other end of the upright rod is attached to a weighted lever. Such weight however not to be so great as not to allow the sails or flaps to open out in the pressure of a gale. In using another description of sails which have no flaps and in which all the sails can at the same time be turned from the wind, the downright shaft rod for turning the sails is made to work by allowing two toothed wheels connected with the lower part of the shaft to be in gear with each other or throwing them out of gear.

[Printed, 10*d*. Drawing.]

A.D. 1861, October 21.—N° 2625. (* *)

CALVERT, FRANCIS ALTON.—This invention, relating to engines which may be worked with either steam or compressed air, consists in supplying (say) steam to one or two cylinders, each containing two pistons; the lower pistons containing one or more vacuum valves to supply the upper pistons with steam when the expansive force of the steam is expended. The exhaust ports consist of annular rows of holes; each air cushion communicates with the admission valve chest; the lower pistons which receive motion from a cam, and traverse about one-fourth the length of the cylinder, are actuated by toggle joints; when only one cylinder is used, the piston is counterbalanced; the upper pistons are connected to a crank shaft or beam. At the commencement of a stroke, both pistons travel together, but when the lowest has completed its stroke, steam is instantly admitted between them, which impels the upper one forward to the end of the cylinder. Each cylinder is single acting, receiving steam to effect the upward stroke, the crank being near the position to obtain full leverage. During the admission of steam it enters the cylinder with full force, regulated by a moveable inclined tappet which is lifted so as not to operate the admission valve when the load is suddenly thrown off.

[Printed, 10*d*. Drawing.]

A.D. 1861, October 28.—N° 2696.

PREDAVALLE, BARTOLOMEO.—(*Provisional protection only.*) —A piston is made to fit the upper part of a cylinder. It is provided with a rod furnished with a lever and weight. The piston is raised by a column of fluid acting on the lower part of the piston. By shutting a valve the fluid is cut off and the weight by a contrivance is made to move on the lever, so as to press more when the valve is closed, and the fluid is forced out and driven into the reservoir of the column.

[Printed, 4*d*. No Drawings.]

A.D. 1861, November 7.—N° 2797.

SCHWARTZ, THEODORE.—Improvements in air engines.

Constant temperatures in the cylinders are maintained either by the injection of liquids whose boiling point is "at least as high

"as the working temperature of the engine," such as paraffinized oil, glycerine, cloride of zinc, &c., or by making as an extension of the working space of the cylinder a cellular surface structure to be heated or cooled by outside agency, (of a liquid or vapour, or hot or cold water) and agitating within the same the air in the progress of expansion or compression by rocking gear or by a body attached to or following the piston.

An engine is described which is furnished with 3 cylinders, the working cylinder communicating with a generator heated by a furnace. The hot exhaust air from this cylinder passes down a regenerator where it parts with most of its heat and is received by the third cylinder or exhaust pump, having a piston double the area of the main piston, and is reduced by this pump to the temperature and pressure of the atmosphere. It thence passes to an accommodation vessel with a pouch-like elastic diaphragm which pulsates with the action of the currents, and by compensating the difference of time and speed in the respective piston movements regulates the supply volume to demand. From this vessel it is taken by the 1st cylinder or pump and compressed to five and a half atmospheres, the heat evolved being neutralized by cold water and thence rises up pipes passing through the regenerator, where it becomes heated by the exhaust hot air. A small side stream proceeds to the furnace and entering the regular heater is raised to a high temperature and the two differently heated streams commingle at the entrance of the main cylinder and yield the desired temperature of four hundred and fifty degrees.

[Printed, 1*s*. 2*d*. Drawing.]

A.D. 1861, November 21.—N° 2928. (* *)

NEWTON, WILLIAM EDWARD.—(*A communication from John Benjamin Root.*)—This invention relates especially to that class of rotary engines in which the main shaft and the rotating piston drum are arranged eccentrically to the outer cylinder, and consists (1), in controlling and directing the combined radial and oscillating movement of the pistons, by packing and fitting to their faces segment-shaped pieces of metal, and providing bearings for them in the drum; also attaching arc-formed pieces to the inner ends of the pistons, which work in grooves formed in the cylinder heads.

2. *Employing* packing rings of a peculiar construction within

the cylinder heads, in combination with the piston drum, piston packing, and cylinder abutment, to prevent the escape of steam.

3. Pressing out the packings into close contact between their wearing and their opposed surfaces, by admitting steam to act expansively against the backs of such packings.

4. Consists "in the arrangement of a valve, partition, and pas-
" sages in combination with a steam jacket, round the cylinder
" of a rotary engine for the purpose of providing for the warming
" up and expansion of the cylinder by steam from the boiler before
" starting the engine, and for keeping the cylinder during the
" operation of the engine warmed and expanded, partly by steam
" from the boiler, and partly by the exhaust steam from the
" cylinder; and it further consists in the arrangement of exhaust
" valves, in combination with the steam jacket and its appur-
" tenances, above mentioned, to provide for the free exhaust of
" the steam in whichever direction the engine may be rotating."

5. Consists in so applying and securing the cylinder heads to the cylinder, that unequal expansion is provided for, and the binding of the piston drum and pistons prevented.

[Printed, 10*d.* Drawing.]

A.D. 1861, November 22.—N° 2939.

EVANS, William.—(*Provisional protection only.*)—The ends of a horizontal bar are connected by rods to cranks on toothed spindles, on the axes of which fly wheels are fixed. The spindles drive toothed wheels, upon the axis of which spindles carrying tappets are fixed. A heavy weight or pendulum is hung from the horizontal bar, and at each end of its course is a hammer or spring. The bar is made to rock and set the pendulum in motion through the connecting rods. The crank, spindles, fly, and tappet wheels are made to revolve and the tappets release the hammers or springs which fall or press on the pendulum and keep up its motion.

[Printed, 4*d.* No Drawings.]

A.D. 1861, December 9.—N° 3083. (* *)

BROOMAN, Richard Archibald.—(*A communication from Charles Dickson Archibald.*)—This invention relates (1) to "the
" hydration or moistening of common air or other elastic fluids to
" the extent of their capacity to retain and transport the watery

" particles in the condition of vapour when the same are to be " employed for purposes of motive power, in combination with " heated surfaces." The operation is effected by forcing water with intermittent pressure through small orifices or elongated flattened apertures, whence it issues in a condition approaching to fog or vapour; water thus comminuted and injected into a volume or current of air and steam, is at once absorbed, the operation being repeated until the requisite degree of moisture is attained.

2. Consists in circulating fluids, thus moistened, through heated chambers or spiral or other form of heated passages, under conditions that will allow of the dilatation or expansion of the whole volume at each stroke of the engine.

3. The construction (to be worked by such expanded fluids) of a single-acting trunk engine, in which the annular space around the trunk above the piston is employed as the air pump; when used with reciprocating action, a separate air pump is provided.

4. The construction and use of a moveable fire-grate or furnace, capable of being simultaneously raised, lowered, or withdrawn, at the moment of starting or stopping the engine.

5. Consists " in the employment of a reciprocating rotary valve, " with moveable port lips adjustable by screws, to compensate for " friction and wear."

[Printed, 10*d*. Drawing.]

A.D. 1861, December 31.—N° 3270.

NEWTON, William Edward.—(*A communication from Eugène Barsanti and Felix Matteucci.*)—The force generated in the explosion of a mixture of atmospheric air and hydrogen, or other explosive mixtures or compounds, is utilised by employing a cylinder with two pistons, the rods of which are attached to the extremities of vibrating levers suspended from suitable bearings, which by connecting rods communicate rotary motion to a crank shaft. When the pistons are nearly in contact, the pendent rods or levers will be made to move forward by the motion of the fly wheel. Sectors on the rods will at first separate, and the piston rods will remain at rest, but a little before the levers have attained their furthest position, the sectors will engage with the rods, and the pistons being made to separate, a charge of the explosive mixture will be drawn in, and when the levers have attained their furthest position will be ignited by an electric spark, the ports *being closed.* The piston rods are then driven forward, moving

free of the sectors, and will finish their stroke when the pendent rods begin to return, which return is effected at first by the pressure of the atmosphere on the pistons, the rods of which act on the sectors. The pistons are brought into contact, and the products of the explosion driven off by the action of the pendent rods.

The power of the engine is regulated in two ways. First, by altering the position of bearing points, which will cause the sectors to come sooner or later in contact with the piston during the forward movement of the pendent rods, by which the length of charge is raised. And, secondly, by opening the passage for the gas, more or less, which will alter the proportions of the mixture to be exploded. The electric spark is produced by a Ruhmkorff's battery, one of the reophores of which surrounds the engine; opposite the extremity of each piston rod is a circuit breaker generally closed by an insulated metallic ring. If one of the pistons draws too heavy a charge, the ring advances more than usual and breaks the circuit, so that no current will pass, and the charge will not be ignited.

[Printed, 1*s*. Drawing.]

1862.

A.D. 1862, January 13.—N° 93. (* *)

GEDGE, WILLIAM EDWARD.—(*A communication from Hugus Sarrazin.*)—(*Provisional protection only.*)—"Improved means or "apparatus for gaining or acquiring motive power."

In a trough partially filled with water is made to rotate a drum or cylinder, " supported on a horizontal shaft, and having on its " outer surface a number of sacks or pockets . . . into each of " which enters a couple of tubes, the other ends of which are " socketed on the drum, and provided with a small toothed wheel " the rotation of which opens or shuts a tap placed in the tube " . . . As the drum rotates it works a pair of bellows, injecting " into each pocket as it passes beneath the water sufficient air to " fill and swell it out, giving it a tendency to rise to the surface " of the liquid, where the air is permitted to escape, and the drum " collapses, to be again inflated, when by the continued rotation " of the drum it again passes beneath the water."

[Printed, 4*d*. No Drawings.]

A.D. 1862, January 16.—N° 119.

MONCKTON, Edward Henry Cradock.—In this invention boilers are dispensed with and small quantities of pure or distilled water or other fluid, or air or gas or mercury are made to circulate through silver or gold plated or aluminium plated circular oval or flattened metallic tubes heated by coal, coke, or gas. The steam or elastic fluid thus passes through the cylinder of air engines and afterwards into a condenser cooled by currents of air or other means, or by water or a shower bath arrangement. The steam vapour or gas is thus condensed and repassed into the original reservoir and thus kept perpetually circulating. If air or gases be used they may be first condensed to the pressure of several atmospheres, by which means very little heat would be required to expand them. Where water is used an arrangement of tubes is described to prevent the water being repelled by the superheated tubes. Locomotive marine and other boat engines may carry condensed gas instead of fuel, in which case the engines are regulated by turning the gas cock.

[Printed, 6*d*. No Drawings.]

A.D. 1862, January 28.—N° 218. (* *)

MENNONS, Marc Antoine François.—(*A communication from Jacques Belou.*)—Improvements in engines actuated by heated air, or by air and steam combined.

The invention consists in adapting the piston of a single-acting engine to the double purpose of on one side drawing in and forcing the atmosphere into the heating furnace, and on the other side to the motive power of the heated air; the capacity of the cylinder on one side of the piston is made to correspond with the volume of a given quantity of air in its cold natural state, and on the other side to the volume of the same quantity when heated and expanded. To effect this, the piston is fitted to a trunk of considerable size, which works through a stuffing box in the cylinder cover; the connecting rod is jointed to the piston at the bottom end of the trunk; the annular space round the trunk is equal to contain the given quantity of cool air required at each stroke of the piston; this end of the cylinder is fitted with a suction valve for the admission of air, and an emission valve which opens when the air is forced out towards the furnace and closes with the back

pressure. The lower end of the cylinder below the piston is all open space; it is fitted with two valves, one for induction, which opens to admit the heated air under the piston, and the other as an outlet valve for the exhaust. Double-action engines may be arranged on this principle, by coupling, end to end, two single-acting cylinders, and working with two pistons on one piston rod, upon which, between the piston, is concentrically interposed a metal tube of the same relative proportionate diameter as explained with regard to the volume of air at its natural temperature and in its heated state; this piston tube works through a stuffing box interposed between the united ends of the cylinders, over which is placed an air-tight vessel divided into two compartments, each of which is fitted with a suction valve for the admission of air, and an emission valve which opens when the air is forced through into the furnace, and closes with the back pressure; these two compartments communicate separately with the cylinder ends; the annular space formed by the piston tube in each cylinder is filled with oil or other suitable liquid, which as the piston alternately comes home to the united ends of the cylinders, is driven up into its respective compartment and forces the air through the emission valve; on the reverse movement of the piston the liquid sinks and draws in the air; the outer ends of the cylinders are fitted with the necessary valves and work the motive power. The cooling of the cylinders after every stroke of the pistons is a very important advantage gained.

[Printed, 8*d*. Drawing.]

A.D. 1862, February 4.—N° 289.

MEEKINS, THOMAS MOSSOM.—Oxygen and hydrogen gases are evolved in a strong iron vessel or generator either in a mixed or a separate state by electricity at an exceedingly high pressure or tension, and are used for the production of projectile force or "after the manner of steam in a steam engine, by intro-" ducing them into a cylinder or cylinders in a mixed or separate " state, if the latter, the cylinder being divided during the whole " or part of its stroke into separate compartments proportioned " to the respective volumes of the separate gases." After expanding the gases augment the power of the engine by being mixed and detonated in the cylinder.

[Printed, 4*d*. No Drawing.]

A.D. 1862, February 26.—N° 522.

BENNETT, JAMES HENRY.—(*Provisional protection only.*)—
"Improvements in steam generators and in engines to be worked "by atmospheric pressure or steam and air combined."

The latter "consist in the employment of one or more cylinders "provided with slide or other valves and forming a vacuum "on one side of the piston or pistons, and supplying air either "singly or combined with steam for the pressure. The crank "shaft of the engine has cranks for working the pumps which "form the vacuum, and supply air to the pipes which pass through "the boilers. I also employ air singly or combined with steam "in connection with a vacuum for working rotary engines. In "the interior of a stationary cylinder there is a shaft working "in suitable bearings, to this shaft is fixed an inner wheel having "upon it projections working against the interior of the cylinder "and acting as a piston at both ends of the stationary cylinder, "on the outside are bands for the purpose of holding the pack- "ing and keeping the parts tight. The air or air and steam com- "bined passes either directly into the stationary cylinder or "through a tubular shaft and through one or more hollow arms "of the inner wheel, and a vacuum produced by pumps is always "maintained on one side of the projecting arms of the inner "wheel or piston."

[Printed, 4*d*, No Drawings.]

A.D. 1862, February 28.—N° 552.

PARKER, JAMES.—"An improved mode of applying steam as "a motive power for propelling vessels and for other purposes."

The third part of this invention "relates to the application of "combined steam and air" "to set in motion all descriptions "of machinery and apparatus."

Steam is discharged into a pipe or pipes carrying with it a quantity of atmospheric air and sometimes also the products of combustion from the furnace. The steam and air finally issue into the water and the air acts on helices or turbines or other wheels immersed in water or other fluid either by its buoyancy or by the power with which it is forced into the water. The air may also be made to rise into inverted buckets and cause bucket chains to revolve, the buckets being made feathering or collapsing to reduce friction.

[*Printed*, 4*d*. No Drawings.]

A.D. 1862, March 19.—N° 769. (* *)

BROOMAN, RICHARD ARCHIBALD.—(*A communication from Serkis Ballian.*)—Rotary engines to be "worked by steam, air, or "any other gas."

This invention consists of a movable plate piston, made to slide to and fro through a morticed shaft by double contact with the internal surface of an "ellipsoidal cylinder" supported on suitable framing which carries the bearings of the shaft. The surface of the shaft revolves against a packing strip bedded in a groove along the surface of the cylinder. There is a metal packing, at each side of the plate piston and also at the extremities, which work against the flanged covering plates enclosing the ends of the cylinder; eccentric to which, on the outside of each cover, there is a stuffing box for maintaining a steam-tight joint round the shaft. The steam inlet passage is on one side of the point of contact between the shaft and the cylinder, and the exhaust outlet passage is on the other side. A cup and tap are provided for introducing a lubricant into the cylinder; and when it is desired to reverse the action the inlet passage becomes the exhaust and the outlet the port of admission. The steam admission tap acts also as a regulator. The two ends of the piston plate are alternately acted upon by the steam each succeeding revolution of the shaft, caused by the eccentric position of the shaft in relation to the sides of the cylinder. The engine is to be worked either by steam, air, or other aeriform vapour.

[Printed, 10*d*. Drawing.]

A.D. 1862, May 20.—N° 776. (* *)

ROBERTS, ROBERT MARTIN.—(*Provisional protection only.*)—"This invention consists in using for obtaining and applying "motive power or force a weighted wheel, the weight being placed "at a given point of the circumference thereof (or only a pro-"jecting lever or radius weighted at its end) such wheel (or "lever or radius) having affixed to the axis or shaft thereof and "turning therewith an eccentric so set on the aforesaid axis or "shaft that the rim of such eccentric shall always be nearest to "the weight on the wheel (or lever or radius aforesaid). This "eccentric to be arranged so as to continuously work into an "eccentric opposite thereto, fixed in the like manner as aforesaid

" on the axis of another and similar weighted wheel (or lever or " radius). The two wheels and eccentrics so arranged as afore- " said cause the weights to traverse a portion of the circle (the " one weight pulling opposite to the other), and in order to " traverse the other part of the circle two, four, or more precisely " similar weighted wheels (or levers or radii) and eccentrics work- " ing in conjunction as aforesaid are connected (by wheel gearing " for instance) with the aforesaid arrangement of weighted wheels " or levers or radii and eccentrics. The weights on the wheels " are to be so placed and the eccentrics so arranged with regard " to each other that whilst (upon the first impetus being given " by moving one of the wheels) one weight will carry on rotation " through one arc of the circle, another weight shall carry on " through another until the entire circle of rotation shall be " effected, when another circle of rotation will begin, and so on. " From one of the axles power may be applied to any purpose " required. Instead of weights applied to the circumference of " the weighted wheel, *electric or magnetic force* might be applied " to the wheel."

[Printed, 4*d*. No Drawings.]

A.D. 1862, March 25.—N° 819.

MOLYNEUX, Echlin, junior.—(*Provisional protection only.*)—Air, gas, or vapour is confined in two tubular air-tight vessels, each of which has at one end a reservoir of fused metal and at the other a reservoir of water. A combination of metallic surfaces such as coil of wire is made to move so that one extremity becomes heated by the fused metal and the other cooled by the water. The air being alternately heated and cooled in the two vessels the difference of pressure produces motive power. In a modification of the engine the generator is made cylindrical and revolves on a spindle so as to come into communication with the reservoirs alternately.

[Printed, 4*d*. No Drawings.]

A.D. 1862, April 9.—N° 1016.

KNOWELDEN, John.—The frame work of steam and other similar fluid engines are made hollow to form a condenser. To the frame an uneven number of cylinders are attached. The frame *is divided* into two chambers, in the first, water to supply the

boiler meets and partly condenses the first discharge of steam; in the second the uncondensed steam meets a fresh supply of cold water and is condensed. "The piston carries a trunk as much " less in diameter as will leave the area of the piston on one " side as much less than the other as will give the desired amount " of expansion, the steam being first admitted on the trunk side " and then expanded on the other." The same object may be obtained by using a cylinder of two different areas. The parts and slides of steam and other elastic fluid engines are arranged so as to cause the fluid to act on both sides of the piston. The inventor also describes surface condensers for steam engines.

[Printed, 10*d*. Drawing.]

A.D. 1862, April 24.—N° 1205.

ASHBY, THOMAS WOODHOUSE.—(*A communication from Ludwig Hauswald, Friederich Hauswald, and Carl Gustav Dittmar.*)—(*Provisional protection only.*)—" Obtaining motive power from " the wind."

On a vertical shaft are a series of cross arms arranged in pairs and intended to receive sails. The cross arms are free to receive an axial motion of about forty-five degrees and each pair are mounted so as to cross one another at right angles and have skeleton frames fixed at an angle of about forty-five degrees. The pressure of the wind upon that sail which is presented to the windmill causes it to take a vertical position, at the same moment the position of its corresponding sail will be shifted so as to present the least possible resistance.

[Printed, 4*d*. No Drawings.]

A.D. 1862, May 22.—N° 1552.

EVANS, WILLIAM.—(*Provisional protection only.*)—The ends of a horizontal bar are connected by rods to cranks on toothed spindles on the axes of which fly wheels are fixed. The spindles drive wheels, upon the axes of which spindles carrying tappets are fixed. A heavy weight or pendulum is hung from the horizontal bar and at each end of its course is a hammer or spring. The bar is made to rock and set the pendulum in motion through the connecting rods. The crank spindles and fly and tappet wheels are made to revolve and the tappets to release the hammers or

springs which fall or press on the pendulum and keep up its motion.

[Printed, 4*d*. No Drawings.]

A.D. 1862, June 9.—N° 1720.

HECKETHORN, CHARLES WILLIAM.—(*Provisional protection only.*)—Motive power is obtained by attaching a series of hollow spokes to a shaft. Bellows having the upper or moveable plate weighted are attached to the spokes and made to communicate with each other by suitable openings in the spokes and shaft. The whole apparatus is placed in a reservoir of water "where it "will be found that the weights on the bellows will force down "and close the covers of those in a vertical position and will "open or separate those bellows on the opposite spokes." The inflated series of bellows on one side of the shaft will rise in the water causing the shaft to revolve.

[Printed, 4*d*. No Drawings.]

A.D. 1862, June 17.—N° 1786.

CRESTADORO, ANDREA.—Motive power is obtained from the two vital functions, necessary to combustion, the inhaling and the exhaling functions. To utilize the first a furnace is made in such a manner that no air is admitted except through the ashpit, into which it passes through a pipe which at one place expands into a hollow vessel or barrel containing a fan wheel connected to a suitable shaft which projects for the object of being applied to drive machinery. The barrel has two orifices where the pipe intersects it, which are at the extremities of a chord less than the diameter of the wheel. The form of the piston or fan wheel may be varied or a reciprocating piston used. The furnace is fed from two lateral chambers containing fuel and having two bottoms, one moveable serving to introduce the fuel. The fire-box has grating on its bottom and two sides. The exhaling action of fire is utilized by transferring the apparatus described above to the chimney, the chimney shaft being made into a pipe which expands into a chamber. Both properties combined are used to make an aerial machine in which the chimney expands into a vessel in which a partial vacuum is formed. The machine has propelling apparatus worked by the air-sucking faculty of fire. The inven-

tion is also applicable for ventilating ships and mines, for propelling submerged vessels for refrigerating, and for treating ores.

[Printed, 6*d*. No Drawing.]

A.D. 1862, June 25.—N° 1867.

HUCH, EDWARD HEINSON, and WINDHAUSEN, FRANCIS JOSEPH.—Fire-air engines.

The apparatus for heating the air consists of an external case or cylinder with hemispherical or curved ends, and an internal cylinder made double, the space being filled with ashes or non-conducting material. The air is forced by the engines into the space between the outer and inner cylinders. Part passes into the inner cylinder by a regulating valve (which may consist of two circular disks with corresponding openings, one fixed and the other moved by a thermostat) at the top of the cylinder, and part through a similar valve, connected to the governor or otherwise, to the fire at the lower part of the cylinder. The products of combustion and compressed air come together at the upper part of the cylinder and pass through winding passages to the engine. The furnace is cylindrical with the fire grating at the lower end. It is fed by a hopper, the fuel being uniformly spread by falling on a cone. Lever stirrers worked from the outside keep the fire in good order. A water case within the outer casing supplies water to keep the valve and pipe cool, and a stream of water on to the fire to produce steam to aid starting the engine. The engines have an outer and an inner cylinder. The piston is long, filled with ashes or non-conducting material, and packed only at one end, the one next the end of cylinder at which cold atmospheric air is admitted. The hot air acts at the other end of the cylinder and forces the cold air first into the space between the two cylinders of the engine and thence into the heating apparatus, passing on its way around the slide valve by which the hot air enters and passes off to the atmosphere or a refrigerator. The piston acts through a series of pistons and levers on a pressure valve, which allows the air to pass into the passages to the heating apparatus. The slide valve is made to fit air tight by two screws fixed in a plate and passing through a frame in which four rollers are set two and two forming one set and set properly by the screws. A particular construction of outlet and inlet valves is also described.

[Printed, 1*s*. 6*d*. Drawings.]

A.D. 1862, July 25.—N° 2110.

JOWETT, Henry Alfred.—Proposes to obtain compressed air by pumps worked by steam engines, water wheels, turbines, or Barker's mills set in motion by falls of water in tidal rivers or reservoirs having a natural or artificial fall. The air is transmitted through pipes having slide valves at regular distances to test their air tightness. The pipes lead from reservoirs of air to the places where the motive power is required, and are laid down under streets or highways. At certain distances are plugs by unscrewing which and connecting the pipe with a portable air engine the air may be used for pumping water to extinguish fires. The pressure is ascertained by the revolutions of a fly wheel working in gear with a second wheel of size to permit of registration by an index similar to the steam or gas index in common use.

[Printed, 4*d*. No Drawings.]

A.D. 1862, July 28.—N° 2143.

SIEMENS, Charles William.—(*Provisional protection only.*) —This invention has reference to the class of engines No. 2074, A.D. 1860.

Mixed air and gas are admitted into the working cylinder and ignited either by having jets of the explosive gaseous mixture or by electricity. The working cylinder is lined with plumbago, fire-clay, or other refractory material. Water is sometimes admitted with the gases into the pumping cylinder both for the purposes of cooling the same and of generating vapour by the heat evolved in compressing the gases. To prevent the destruction of the reservoir by an accidental explosion, it is provided with an aperture closed by a plate of very thin and tough metal which will readily yield to any increase of pressure sensibly exceeding the usual working pressure. The products of combustion are discharged into the atmosphere through a regenerator through which the combustible air and gases pass in the opposite direction.

[Printed, 4*d*. No Drawings.]

A.D. 1862, August 9.—N° 2228.

MACINTOSH, John. — (*Provisional protection only.*) — This *invention* "consists in the rapid generation of power by the aid

" of oxygenous fuel composed either of coke, coal, and nitrate " of soda, or coke and nitrate of potash." Sulphur, chloride of potash, pitch, resins, and other substances may be used. " The prepared fuel is put into closed tubes or furnaces with " valves for the escape of the gaseous products of the combustion " which may be used alone or in a combination with air, steam, " or other fluids in giving motion to machinery. This oxy- " geneous fuel may be put into ordinary steam boilers."

[Printed, 4d. No Drawings.]

A.D. 1862, August 19.—N° 2322.

DEMBINSKI, HENRY.—(*Provisional protection only.*)—A wheel with teeth on the in and out sides of its rim is suspended on the upper of two similar pinions one placed vertically above the other, whose shafts are kept apart by a bar. The axes of the pinions rest on and yield to the pressure of bars acted on by springs of steel, compressed air, or caoutchouc. The pinions will yield to the traction on their axes and revolve and communicate a uniform rotary motion to the wheel. To make the motion more easy other pinions are added to the two before mentioned. The last gear into pinions placed outside the wheel. The apparatus is made to work between two iron plates or wooden planks.

[Printed, 6d. Drawings.]

A.D. 1862, August 22.—N° 2343.

MONSON, CHARLES.—Repeating rotary engines set in motion by a current of a liquid æriform or gaseous character, and consisting in one or more chambered shafts, a series of wheels, arms, or equivalents, and a series of air-tight boxes or chambers combined and arranged and provided with induction and eduction passages so that the same current shall be made repeatedly available for mechanical power. In the engine described as one mode of carrying out the invention steam passes from a chest to a chamber in the shaft and thence to hollow arms made to revolve by its escape, from these the steam escapes into a vessel containing the arms and thence passes by proper passages to a second shaft chamber and a second set of arms contained in a second vessel. The same current after passing through several similar sets escapes. The steam is or may be used expansively by a progressive enlargement of the bore of the arms.

[Printed, 8d. Drawing.]

A.D. 1862, August 29.—N° 2403.

COURTENAY, Reginald. — (*Provisional protection only.*) — Motive power is produced by changing the specific gravity of an elastic fluid by means of revolving weights. These are attached at equal distances to the circumference of a wheel by being placed on the extremities of levers jointed to the circumference. The play on the hinges is restricted by springs formed by vessels containing air or other elastic fluid. These springs or vessels are alternately contracted and expanded by the weights, and the wheel being vertical and immersed in fluid, one side will become heavier than the other, and descend from the condensation being all on one side.

[Printed, 4*d*. No Drawings.]

A.D. 1862, September 16.—N° 2538.

WEATHERDON, Baldwin Fulford, and MONCKTON, Edward Henry Cradock.—(*Provisional protection only.*)—An " engine to be worked by volatile chemical agents " " capable of " being readily converted into vapour and condensed by ordinary " means at temperatures below the boiling point of water." The cylinders and working parts of the engine are wholly enclosed and caused to work within the boiler or generator in such a manner as to communicate rotatory motion thereto. The boiler is used with steam or hot water jackets surrounding it and either fixed or rotating, and with condensers in like manner.

[Printed, 4*d*. No Drawings.]

A.D. 1862, November 3.—N° 2963.

MUSGRAVE, James.—Valves of steam hammers and steam hydraulic and gas engines are made to work " in a cylinder, the " piston of which forms the valve. The steam or other fluid for " working the valve after passing through a very small slide valve " is admitted above and below the piston valve, the centre portion " of which forms the valve for admitting the steam or fluid to the " cylinder."

The small slide valve is moved by levers actuated by the cylinder or crank shaft or other convenient part. The traverse of the piston valve is governed by opening or contracting the exhaust passages at each end of the cylinder in which it revolves, and the piston is thus prevented from striking either end.

[Printed, 10*d*. Drawing.]

A.D. 1862, November 13.—N° 3059.

GEDGE, William Edward. — (*A communication from Jules Bonnard.*)—(*Provisional protection only.*)—This is an engine having a double-acting compression cylinder from which compressed air passes to a main cylinder placed above a fire-box. The warm air after having expanded in the main cylinder goes into the fire-place or the chimney.

[Printed, 8*d*. Drawing.]

A.D. 1862, November 14.—N° 3067. (* *)

WILSON, Edward Brown.—(*Provisional protection only.*)—This invention relates to a peculiar mode of connecting a pipe for the conveyance of steam, air, gas, or other fluid, to oscillating or vibrating cylinders. As an example of its application, in the manufacture of iron and steel, to the oscillating converting vessels, in lieu of the ordinary method of conveying air thereto, by passing it through the trunnions, "it is proposed to bring the blast "pipe centrally with, but disconnected from the trunnions or "centres on which the vessel turns, and as near to the same as "may be convenient, at the end of which pipe a suitable connecting joint is made that will allow the pipe to revolve freely, such "pipe being in the form of a radial arm, and connected to the "other end with the atmospheric vessel. This mode of conveying air to an atmospheric converting vessel is equally applicable "to the conveying of steam to the oscillating cylinders of steam "engines, and may be employed in all cases where steam, air, "gas, or fluids are required to be conveyed to vessels or receptacles which oscillate or vibrate upon trunnions or centres."

[Printed, 4*d*. No Drawings.]

A.D. 1862, November 19.—N° 3108.

ARBŌS, Jacques.—The invention consists in a gas engine with an apparatus for generating gas forming one apparatus. A furnace lined with fire-brick is placed in the centre of a steam boiler and is supplied with fuel from above and with air which may be mixed with steam under a grating near the bottom. Liquid combustible materials can also be introduced into the furnace to increase the intensity of the gaseous mixture generated. This mixture is composed of oxide of carbon, hydrogen, azote,

and a small proportion of carburetted hydrogen, and passes from the furnace to a vessel containing red hot coal for decomposing the carbonic acid and vapour which escaped decomposition in the furnace. The mixture then passes into the gas engine being first mixed with an amount of air regulated by a tap worked by hand according to the richness of the mixture in carburet of hydrogen, and is exploded at proper intervals in the two ends alternately of a cylinder by an electric spark, excited by a commutator worked by the piston rod. The cylinder is surrounded by a water jacket, the water in which, becomes heated and is then pumped into the boiler surrounding the furnace. The steam from the boiler passes to a steam chest, engine, or other destination.

[Printed, 6*d*. Drawing.]

A.D. 1862, November 20.—Nº 3121.

SEILER, Frederic.—This relates to certain "modes of apply-"ing compressed air" and "communicating motive power to "machinery more or less distant from the prime mover." The first mode is by means of two cylinders and pistons. The air in each end of one cylinder is allowed to pass by tubes to the corresponding ends of the other cylinder and thus, on the piston of the first cylinder being moved by the prime mover, that of the second cylinder will be actuated by the compressed air. A second mode is by making an air pump actuated by the prime mover to compress air to a high pressure and actuating a cylinder and piston at the required distance by such compressed air which after partly expanding is returned to a low pressure reservoir which supplies the air pump. The high pressure air may also be used to drive water from one vessel to another in a stream which drives a "turbine in the usual manner," or may be made applicable to pumping water in mines.

[Printed, 10*d*. Drawing.]

A.D. 1862, November 21.—Nº 3137.

ORTH, Charles Anton.—The machine from which motive power is obtained consists of two sets of three rollers having toothed flanges. The rollers of one set are placed one over the other in gear and with their smooth surfaces also in contact. The upper rollers carry a rack or toothed plate on which two other rollers work, one over each set. On these rests a beam to which

pressure is applied by a screw or otherwise, which being transmitted through the upper to the lower sets of rollers works them to and fro in alternate directions. The lowest rollers of each set rest on a toothed base plate and contain within them smaller rollers on which a platform rests which supports what is called a union lever. This consists of two portions, an upper and a lower, held together by guide pieces and composed of two arms crossing and jointed to each other near one end and jointed at that end to other arms. The arms of this union lever approach and recede in the manner of lazy tongs. They are actuated by the middle of the three rollers and transmit the motion to the crank shafts which again transmit it to a compound lever from which motion can be communicated as desired. The union lever may be employed without the rollers and worked by a handle or other ordinary means, and the power imparted transmitted for motive purposes by cranks.

[Printed, 8*d*. Drawing.]

A.D. 1862, November 27.—N° 3179.

KEYWORTH, THOMAS. — Improved motive power machinery consisting of a series of levers all except the last of equal length, and jointed in the long arm which exceeds the shorter arm in the proportion of 3 to 1. The short arm of one lever is opposite the long arm of the next to which it is connected by a jointed metal bolt passing over and revolving on two rollers one placed vertically above the other. These rollers are placed on the ends of two revolving shafts bearing at their other ends two small pinions which gear into the interior toothed rim of a large (sun and planet) wheel. The last wheel is bevilled and gears into a bevilled pinion in a crank shaft revolving crosswise of the axis of the sun and planet wheel. The short end of each jointed lever is connected by a vertical rod to another cranked spindle used for imparting rotary motion. The motive power obtained by the machine may be transmitted in any convenient manner.

[Printed, 10*d*. Drawing.]

A.D. 1862, December 1.—N° 3220. (* *)

CLARK, WILLIAM.—(*A communication from William Foster and Robert Foster.*) — This invention relates to rotating apparatus applicable as a pump, water meter, or an hydraulic, steam, or gas engine. It consists of a fixed cylindrical case, wherein, upon an

axis which works in eccentric bearings on the cylinder ends, is fixed a revolving drum cylinder of much smaller diameter; the eccentricity of the axis with regard to the inner surface of the cylindrical case, brings the periphery of the drum at one point close to the case, so as to leave a crescent-formed space between their two surfaces. Two longitudinal mortices are cut at right angles with each other completely through the drum cylinder, intersecting each other at the centre; in these mortices are placed to slide, two piston plates, the ends of which are furnished with packing strips, kept in constant contact as the drum revolves, with the cylindrical case, which must be bored slightly elliptical so as to deviate almost imperceptibly at opposite sides from a true circle. The admission and emission passages to and from the cylinder open at each side on the plane of the drum axis, and suitable packings are employed round the axis and drum end. The flow of steam or fluid is continuous, and so acts against the ends of the piston slides as they come round in succession, as to impart rotary motion to the drum and axis.

[Printed, 10*d*. Drawing.]

A.D. 1862, December 8.—N° 3283. (* *)

BUDDEN, JOHN LEGGETT.—(*A communication from Woodford Pilkington.*)—(*Provisional protection only.*)—This invention relates to "means or apparatus for obtaining and applying motive power " for propelling and other purposes," and is supplementary to a prior communication from W. Pilkington, No. 2317, A.D. 1860. The present invention consists "in the application of a fixed " steam guard or guards (by preference of a cylindrical form) to " the screw propeller or turbine wheel described in the specifica- " tion before referred to and within the circumference of which " the blade or vanes of the screw or turbine wheel revolve. This " 'guard' is suitably fixed so as to be entirely independent of " the 'screw' or 'turbine' wheel revolving within it. The inner " circumference of this steam guard is furnished with floats or " steps which cross the direction of the pitch of the screw some- " what like the steps of a treadmill or teeth of a wheel with " internal cogs, and upon which the steam or other propelling " medium is caused to impinge as it issues from the passages, " terminating at the periphery of the blades or vanes of the screw " or turbine wheel, by which arrangement, in the application of " this invention to a submerged screw propeller, the steam or

" other fluid in discharging is projected against the 'steam " 'guard' in place of going directly into the water, as described " in the former specification. The guard or cylindrical ring may " completely surround or enclose the screw or turbine, except " being open at each end, or it may be formed in belts or zones " placed over the the emitting orifices. The steam passages are, by " preference, lined or protected by non-conducting material in " order to avoid condensation of the steam or vapour in its " passage from the steam pipe to the emitting orifices."

[Printed, 4*d*. No Drawings.]

1863.

A.D. 1863, January 17.—N° 155.

BOUSFIELD, GEORGE TOMLINSON.—(*A communication from Elmer Townsend.*)—" Hot air engines."

The fire box is made of a single casting and lined with fire brick. The lower part of the cylinder has two casings and the space between is filled with plaster. The upper portion of the cylinder which comes in contact with the piston is isolated from the lower portion, a cylinder of thin sheet metal being interposed between them. Beneath the piston is a prolongation which descends on the down stroke to near the bottom of the chamber. Above the cylinder is an air pump worked by a hollow piston with a hollow rod which is fastened to the piston of the working cylinder. The air is forced through this hollow rod into a cavity in the upper part of the working piston in which it is made to circulate by a deflecting plate and whence it passes to the furnace and afterwards to the lower part of the cylinder.

[Printed, 1*s*. Drawings.]

A.D. 1863, January 20.—N° 174.

SMITH, JAMES, and CHEASE, SYDNEY ARTHUR.—(*Provisional protection only.*)—Two or more tanks are secured on the bed of the engine, or if oscillating, are supported by trunnions. In each tank is a cylinder within which is another cylinder or float made air tight, and after the fashion of a buoy. Its external diameter is to the internal diameter of the outer cylinder as 49

to 50. A piston made air-tight in the outer cylinder is fixed to the bottom of the float. In its centre is a metal valve to which is attached gear having a rod passing through a tube in the float and united to eccentric gear. From the head of the float a rod passes through the head of the tank and is united by a crosshead or lever and a connecting rod with the crank. The tank is filled with water and the valve opened by the regulating gear. The water on the face of the piston passes through the valve and the float ascends. When arrived at the full throw of the crank the valve is closed by the eccentric and the float descends, producing action and re-action throughout the whole system.

[Printed, *4d.* No Drawings.]

A.D. 1863, January 28.—N° 261.

BROMWICH, BRYAN J'ANSON.—A series of annular cases fitted with air-tight covers but free to rotate on their seats are mounted one above the other with a vertical shaft concentric therewith. To the inner face of each of these covers a piston is attached which fits the case, and each case is provided with a supply and discharge pipe between which is a valve maintained in position by a spring but which will yield to the pressure of the piston so as to allow it to pass. Compressed air enters the hollow ring and operates with all its force against the piston, for the valve being seated immediately behind the point at which the air enters there is no escape in that direction, and the piston is forced round, thereby causing the steel ring to revolve and ultimately causing the vertical shaft to revolve. The air after having operated in one case is conducted to another, and ultimately by the rotation of the central shaft forced back into the reservoir from whence it was supplied.

[Printed, *10d.* Drawing.]

A.D. 1863, January 30.—N° 281.

LLOYD, NICHOLAS PHILIP COMINS.—(*Provisional protection only.*)—A metallic tube is inserted at a right angle into a metallic plate. A metallic rod is inserted into a corresponding plate. These plates are united by a hinge. Another apparatus similarly constructed, is used. The tube of No. 1 and the rod of No. 2 *pass through* aper tures in one side of a cubic metallic air-tight

box from which the air is extracted by a pump. A stop-cock connected with the tube of No. 1 will admit air between the metallic plates. The air will force No. 2 through the chamber and will raise No. 1 to the position it occupied while quiescent and cause the rod of No. 2 to pass without the chamber. Air admitted alternately into each receiver will move the united apparatuses in alternate opposite directions.

[Printed, 4*d*. No Drawings.]

A.D. 1863, February 14.—N° 402.

DEMBINSKI, HENRI.—(*Provisional protection only.*)—A wheel with teeth on the in and out sides of its rim is suspended on the upper of two similar pinions one placed vertically above the other, whose shafts are kept apart by a bar. The axes of the pinions rest on and yield to the pressure of bars acted on by springs of steel, compressed air, or caoutchouc. The pinions will yield to the traction on their axes and revolve and communicate a uniform rotary motion to the wheel. To make the motion more easy other pinions are added to the two before mentioned. The last gear into pinions placed outside the wheel. The apparatus is made to work between two iron plates or wooden planks. Instead of one wheel two of different radii may be used, placed concentrically. Both are without axes and rest on brackets (represented as toothed) with axles resting on a frame.

[Printed, 10*d*. Drawings.]

A.D. 1863, February 28.—N° 573.

COURTENAY, JOSCELINE.—(*A communication from Reginald Courtenay.*) -- (*Provisional protection only.*) — Motive power is produced by changing the specific gravity of an elastic fluid by means of revolving weights. These are attached at equal distances to the circumference of a wheel by being placed on the extremities of levers jointed to the circumference. The play on the hinges is restricted by springs formed by vessels containing air or other elastic fluid. These springs or vessels are alternately contracted and expanded by the weights and the wheel being vertical and immersed in fluid, one side will become heavier than the other and descend from the condensation being all on one side.

[Printed, 4*d*. No Drawings.]

A.D. 1863, March 9.—N° 653. (* *)

HUGON, Pierre.—This invention consists of a gas engine, in which the explosive force of the gaseous mixture acts "upon an " intermediate column of water, and thus indirectly upon the " piston. The cylinder, in which the piston works, is separated " from the tubes wherein the explosion takes place; the power " resulting from the dilatation of the gases is employed to expel " a certain quantity of water from the explosion tube and to pro- " duce a vacuum, the effect of which is added to that due to the " condensation of steam arising from the combination of the " hydrogen and oxygen and can be utilized in the cylinder.

" The several reservoirs of the engine are arranged in such " manner that the same water always circulates in the engine, " and that that which has been expelled from the tube fills the " cylinder on the side opposite to the chamber, which is at the " moment in connection with the vacuum produced. The cylinder " being originally full of water it is the exhausting towards the " vacuum of the liquid contained in one of the chambers which " produces the movement of the piston; the water expelled from " the tube which fills the opposite chamber, the capacity of which " increases gradually, acts in the same manner at the following " explosion." "Water enters every part of the engine."

The mixture is exploded either by means of "an electric spark " an incandescent platinum wire," or "a gas jet." The slide lever shaft of the engine bears "rollers or discs, made of hardened " india-rubber, or other insulating material, carrying copper " plates, which transmit the electric spark" from an induction coil "at the proper moment to explode the mixture."

[Printed, 2*s.* 10*d.* Drawings.]

A.D. 1863, March 18.—N° 732.

MOREL, Auguste.—"Generating carbonic acid."

The generator is self-supplying, regulates itself at a constant pressure, and produces a regular current of gas which may be used (among other applications) in a small motor in the place of steam or compressed air. There are two vessels, the lower containing a carbonate and the upper an acid which is introduced into the lower vessel. The gas produced passes into a washing reservoir. A tube leads from the top of the lower vessel, and is *represented* as passing into the upper part of the upper vessel,

and dipping to near the bottom. This vessel is connected with a safety apparatus consisting of two small reservoirs, one placed vertically above the other, and connected by a tube dipping to near the bottom of the lower one, which is filled with water.

[Printed, 1*s*. Drawings.]

A.D. 1863, March 25.—N° 781.

MONSON, CHARLES.—Employs two similar vessels connected by a pipe. The vessels are exhausted of air, and one partly filled with water or preferably with a fluid which boils at a less degree of heat. The fluid is partly vaporised by immersion in a hot water bath or other means, and the steam or vapour by its pressure on the fluid drives it through the tube to the other vessel, which in its turn is immersed. A motive power is thus obtained from an oscillating or rotary motion of an axle, on which several of such pairs of vessels are fixed. It may be advantageous to use two fluids, one being such as mercury, and a lighter one for the rapid generation of steam. The upper vessel may be cooled by allowing cold water to flow into it in its highest position from a small removeable vessel attached it. The steam may also sometimes be advantageously generated in separate vessels from those which contain the vessel for the weight.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1863, April 17.—N° 968.

LAWSON, ROBERT HENRY, and DARLOW, WILLIAM.—(*Provisional protection only.*)—A cylindrical box is divided in the centre by a partition, and suspended at its centre on pivots. The box has two holes, partially closed by balls or ball valves, and also two air holes. On the top two smaller tubes are fixed, at an angle of about 5°, so that one end is directly over the larger orifice, and the other end projects beyond the end of the partition of the box. The tubes are open or partly so, and partly filled with pieces of iron, wood, and other substances. The box is entirely filled with mercury. The end of it opposite to that where the upper tubes overhang is furnished with a box, about a diameter and a half of the box in length. The apparatus is pulled over on its pivots by power applied to the rod. The mercury then enters the small tubes, and causes the pieces of iron and wood to ascend. The weight of the balls and other

pieces of iron causes the tube to lose its inclined position, and return to a horizontal position. The mercury then runs out from the tubes into the box, and the apparatus is ready for another tilting operation.

[Printed, 4*d*. No Drawings.]

A.D. 1863, April 20.—N° 981. (* *)

BLANC, CLAUDE.—This invention relates to apparatus for combining air with steam, and using their united elastic force as a motive power. The objects to be obtained are, 1, increase of power; 2, loss of power prevented by restoring the steam (which would otherwise be allowed to escape) to the generator, and which consequently renders the use of feed pumps unnecessary; 3, economy of fuel; and 4, preventing the incrustation of calcareous and sedimentary deposits in the boiler. The exhaust steam from the engine is received into a chamber enclosed in a case or jacket; by means of a double acting air pump, the atmosphere is forced into the chamber, there to commingle with the exhaust steam. The combined fluids are drawn through a pipe attached to the lower part of the vessel by means of a pump, which afterwards forces them on through service pipes into the boiler or generator, the steam being in a partially condensed state; the service pipes are provided with stop valves to prevent any reflux of water from the boiler. The air is admitted, through a perforated distributing plate, into the upper part or neck of the chamber in regulated quantities, by means of a cock containing a compound plug and a pipe in connection with the pump. The working speed of the pumps will be regulated to suit the speed of the piston of the engine to which the apparatus is applied.

[Printed, 8*d*. Drawing.]

A.D. 1863, April 21.—N° 989.

LLOYD, NICHOLAS PHILIP COMINS.—(*Provisional protection not allowed.*)—A tube expanded each way towards its middle in the form of two cones connected by flanges at their circumferences, is contained within an air-tight chamber, from which the air is extracted by a pump. The portions of the tube projecting without the chamber are provided with stop-cocks, which, being alternately opened, will, by the pressure of the atmosphere,

effect alternate motions of the tube within and without the chamber.

[Printed, 4*d*. No Drawings.]

A.D. 1863, April 30.—Nº 1092. (* *)

STEWART, CHARLES PATRICK, and KERSHAW, JOHN.—This invention relates to "engines, machinery, and apparatus for "obtaining compressed air, and for applying the power thereof in "propelling railway and other carriages." The air is compressed to the required degree, by the successive operations of the combined apparatus which actuates a body of water, whereto recipro cating motion is imparted by a piston in a horizontal cylinder, actuated by the power of a duplex steam engine, the cylinders of which are disposed, in relation to each other, at an angle of 90°. The periphery of the piston in the water cylinder is covered with wood. Each end of the cylinder is connected to a vertical chamber, wherein the water simultaneously rises in one chamber and falls in the other, alternating as the motions of the piston in the cylinder are reciprocated. Suitable inlet and outlet air valves are fitted to the upper part of each vertical chamber; the air forced through the outlet valve is conveyed to the next section of the apparatus, which, together with the other sections, are of gradually decreasing dimensions. The volume of the air is gradually reduced by the successive operation of each section, passing from the first to the second, and so on to the last, and thence into a receiver or reservoir. The engine for applying the power of compressed air to the propulsion of railway and other carriages is somewhat similar in the mechanism to a locomotive worked by steam, but in the place of the boiler and furnace, a series of cylindrical reservoirs, connected with each other by suitable pipes, is disposed along the centre of the engine framing. Each reservoir may have a separate pressure gauge, and suitable valves provided for opening the communication with the first or high-pressure cylinder, whence the compressed air after having operated the piston therein, is exhausted into the second or low-pressure cylinder, which is of larger dimensions; other cylinders may be used, so as to completely exhaust the expansive force of the air. The area of each piston is relatively proportioned to the expansion, so that the power of each is about equal. The air is admitted to the high-pressure piston at its full pressure without throttling, and the

speed of the engine is regulated by varying the cut-off, without altering the eduction valve, or effecting either of the valves of the low-pressure cylinder. Stationary air-compressing engine-houses must be provided at intervals along the line of road.

[Printed, 1*s.* 6*d.* Drawings.]

A.D. 1863, May 5.—N° 1119.

BOOTHROYD, William.—(*Provisional protection only.*)—A cast-iron or other framework is provided with four pulleys to carry a horizontal main shaft. On the shaft are two bosses, each with four arms connected by four cross bars or plates. A spur wheel on the shaft is geared into another spur wheel on a counter shaft, provided with a toothed wheel, giving motion to an excentric tappet or lever attached to a carriage for pulling or pushing weights off and on the cross bars or plates. Another shaft receives motion from the counter shaft, and gives motion by toothed wheels to two rollers provided with chains or ropes for lifting the weights when pulled off the plates into their proper position. The rollers turn in opposite directions, and either may be put in gear as required. Above the frame work is a carriage and tramway with a sheaf pulley for the chains to work on, the carriage being moved to-and-fro by the excentric tappet or lever.

[Printed, 4*d.* No Drawings.]

A.D. 1863, June 11.—N° 1449. (* *)

CLARK, William.—(*A communication from Antoine Merlanchon.*)—This consists in effecting the combination of oxyyen with the fuel, under pressure in a closed chamber furnace without fire-bars, so as to produce the greatest amount of heat by the introduction from a receiver of a limited supply of air. The heat and burning gas generated are brought into contact with water in an extreme state of sub-division, and the gaseous mixture resulting from the vaporization of the watery particles, and their intermixture with the burning products of combustion, is applied as a motive power to actuate a piston in a cylinder or receiver.

The generator consists of a cylindrical chamber divided by a vertical partition into two compartments which communicate at the lower part; one of these, the combustion chamber, is lined with sheet iron, and the other, or generating chamber, is lined with refractory bricks, as also is the sole of the furnace, which is

fitted with a door capable of resisting pressure. One part of the air necessary to support combustion is introduced to the fuel at the base of the combustion chamber, and the other portion at the base of the generating chamber, so as to mingle with the burning products of combustion. A pipe leading from the upper part of the generating chamber communicates with the receiver, whereinto, through a cap at the top, the water is forced in at a great speed in a circular film, which rises against a projecting plate, whence it is thrown downwards in a finely divided state amongst the ascending burning gases. The heat vaporizes the watery particles and superheats the vapour, which is diffused amongst the gaseous products from the generator, and used to operate the piston in the high pressure cylinder, and thence conducted to act expansively on the piston in the low pressure cylinder of an engine constructed upon Woolf's system. All the details are fully described and illustrated, including a pyrometer, which is employed to indicate the temperature either in the vicinity or at a distance from the apparatus.

[Printed, 5s. 4d. Drawings.]

A.D. 1863, July 27.—N° 1868. (* *)

WHITTAKER, JAMES.—" Improvements in engines for obtain-" ing motive power by steam, air, or any other vapour," in the cylinders of which, connected to two piston rods which work respectively out at the opposite ends of the cylinder, four reciprocating pistons are arranged to operate. The cylinder is furnished with five steam inlet ports. Two illustrations are shown and described. The first consists of a cylinder composed of short lengths which, when united, form a cylinder sufficiently large to contain four pistons, say for distinction Nos. 1, 2, 3, and 4, and also longitudinal space for action. Pistons 1 and 3 are mounted a suitable distance apart, upon one piston rod, and piston 4 is disposed in the usual manner upon the piston rod which works out of the cylinder at the opposite end, piston 2, being united to piston 4 by two subordinate rods which work through stuffing boxes disposed outside the high-pressure section, No. 3, of the cylinder; this section is of much smaller diameter than the others, and into it the steam at high pressure is first admitted, and alternately operates between the small piston 3 and pistons 4 and 2 in succession, whence it exhausts into the other

section, and thence, having reached its terminal force, is discharged into the condenser. The second illustration exhibits a cylinder containing four pistons of equal diameter, united and operated by high and low-pressure steam in the same manner, the subordidate piston rods, which unite pistons 2 and 4, passing through stuffing boxes in the immediate piston 3. The cylinder is made in one casting, and, like the other, is furnished with five steam inlet ports, and three steam boxes containing two single and one duplex slide valve.

[Printed, 10*d*. Drawing.]

A.D. 1863, August 10.—N° 1968.

DEL RIO, PATRICIO MARCOS—(*Provisional protection only.*)—Machine for obtaining motive power, consisting of a pendulum, two wheels, one mounted on a shaft, and a weight which is moved up and down by a chain or cord passing over pulleys to one of the wheels. The pendulum moves one of the wheels which puts the other in motion, by which the weight is raised. The latter falls and strikes the pendulum, forcing the pendulum to its first position, after which the same movements again take place.

[Printed, 4*d*. No Drawings.]

A.D. 1863, August 24.—N° 2093.

GUILLEMOT, LOUIS.—Perpetual motion is derived from a machine composed of ten wheels fixed at equal distances upon an axletree, and forming a sort of cylinder. They support 72 coupled levers placed between them by groups of four couples. The levers have an appendix consisting of a part of a circle disposed in such a manner as to grapple with articulated levers, of which there are nine, one corresponding with the middle of each interval of the wheels. At a certain moment the coupled lever placed inside the motive cylinder and the external lever make but one lever, which then presses with all its weight on one of the points of the circumference of the motive cylinder, in order to make it run over a little more than the 36th part of the circumference. The 72 levers are weighted at one end fixed on axletrees at points near their centres, and tied together by articulations. The external levers grapple themselves four times with different inside couple levers in each revolution. A ball or wheel rolls on the interior motive

levers. It is let go from a spring when the lever is oblique and about to act, and descends rapidly, giving a greater force to the wheel. When the lever has acted, the ball returns to its first position. Latches on the wheels retain at any distance required the interior levers, and let them loose by passing before a point of resistance.

[Printed, 1s. 8d. Drawings.]

A.D. 1863, August 24.—N° 2098. (* *)

BROOMAN, Richard Archibald.—(*A communication from Auguste Nicol Otto.*)—" Improvements in air and gas engines."

" The up stroke of a piston is effected by the explosion within a " cylinder of a mixture of air and gas by an electric spark, while " the down stroke of another piston is performed by the pressure " of the atmosphere." A perforated piston having a hollow piston rod is placed inside a cylinder, another piston rod with a solid piston is fitted inside the hollow piston rod, the second and solid piston rod being free to work up and down in the hollow rod. The passages of the perforated piston are covered by a plate, and the said piston only descends to the air inlet port, while the solid piston extends to the bottom of the cylinder, where the explosive mixture is admitted. When the perforated piston is raised to the top of its stroke, the explosive mixture admitted below the solid piston, and air between the two pistons, the explosion drives the two pistons nearly into contact, the air passing off through the apertures in the upper piston; cooling then takes place, a vacuum is formed, the upper piston is thereby driven to the bottom of its course, and the solid piston falls (by its own weight) on the bottom of the cylinder. The expelled air rushes from the cylinder (which has a tight cover) into a suitable reservoir, from which it subsequently escapes.

In the cylinder near its bottom there are two insulated wires in connection with a galvanic battery; one of these wires is connected to the engine, and the other to an insulated spring, with which a projection on the main shaft of the engine comes into contact at each revolution. When the said contact is made an electric spark is produced in the cylinder, and the mixture of air and gas is thereby exploded.

[Printed, 10d. Drawing.]

A.D. 1863, September 5.—N° 2191. (* *)

MOODY, THOMAS, and MOODY, EDWARD TOMS.—(*Provisional protection only.*)—The gases from the decomposition of water are used as a motive power, a magneto-electric apparatus being employed to decompose the water.

The generating apparatus.—A Barker's mill is situated concentrically to a number of permanent horseshoe magnets, the lower or cylindrical portion of the said mill having suitable valves which allow free ingress of the water contained in the space enclosed by the magnets into the said lower portion of the Barker's mill. An exploding chamber is level with the poles of the magnets, and a series of electro-magnets is mounted at the upper extremity of the mill, the electricity obtained from them being conducted to suitable "voltometers" [voltameters?], where it will be employed to decompose water or other fluid.

"Of the gases so evolved one portion goes to supply the explo-" sive chamber of the 'mill' with sufficient energy to supply the " place of the head of water usual to such reaction engines, the " other into a reservoir ready to be applied in the production of " motive power.

[Printed, 4*d*. No Drawings.]

A.D. 1863, September 17.—N° 2289.

WHITEHEAD, JAMES.—(*Provisional protection only.*)—"To " each end of a long lever I connect a rod, to which is also con-" nected a piston or plunger working in a cylinder fitted with " suitable inlet and outlet valves communicating by pipes with a " reservoir to contain compressed air which is supplied by a pipe " to the cylinder of an ordinary steam engine. The aforesaid " long lever is actuated by the patented (hydraulic) machinery" described in No. 1239, A.D. 1863, "and works the air pumps for " charging the reservoir."

[Printed, 4*d*. No Drawings.]

A.D. 1863, September 18.—N° 2304.

SMALL, THOMAS.—(*Provisional protection only.*)—Two sector wheels with teeth on a portion only of their circumference are mounted, one fast and the other loose, on a revolving shaft. *They revolve* in different directions and their teeth gear at different

times into the teeth of a rack which is thus given a reciprocating motion. The rack is connected at one end to a toothed wheel, whose teeth gear into a similar rack connected to another toothed wheel of larger diameter than the last, and so throughout a series of racks and wheels increasing progressively in diameter. Power is thus gained and may be imparted in any convenient manner.

[Printed, 4*d*. No Drawings.]

A.D. 1863, September 19.—N° 2314.

DE ANGELIS, Ignazio. — (*A communication from Federico Salomone.*)—An apparatus for obtaining motive power consists of a shaft which revolves in a socket and carries a long arm to which are attached two rods having bearings for an axis slightly inclined. Two drums are keyed on this axis; each consists of two discs one plane and the other a truncated cone. Weights connected to the axis by arms are suspended within the drums. They are free to move on their axes and to fall in and out of equilibrium, but are prevented falling too far on the return stroke by stays. The weights of one drum are placed so as to break joint with those of the other. The axes of the weights project beyond the drums, and carry pins. A moveable circular platform is capable of travelling between platforms upon an inclined circular path on the bed plate which supports the shaft. Upon the top surface of the moveable platform are pins which abut against the pins of the axes of the weights when the drums rotate. By raising a bar the moveable platform will be fixed and as each weight in turn falls over or drops out of its equilibrium the drum will be moved round, and wheels attached to the lever or arm on the central shaft will be driven on their way and a rotary motion communicated to the shaft.

[Printed, 1*s*. 6*d*. Drawings.]

A.D. 1863, September 25.—N° 2365.

LLOYD, Edward—(*Provisional protection only.*)—The invention relates, first, to wheels to be worked by water, and, secondly, to rotary wheels impelled by the pressure and elastic force of steam or other elastic fluids, which enter at the axis and pass to the periphery of the wheel along a channel forming the involute curve, struck from a circular evolute placed at the axis and terminating against the circle forming the periphery. The curve of the channel is then reversed, one side of the channel is formed by

the inside periphery of the wheel, and the other by the outside of the involute curved channel from the axis to the periphery, the passage finally terminating at a point half or three quarters of the circle from the point of junction between the involute and the circle. The involute curved channel is about the same area from the axis to the point at which it reverses, and the channel is smallest at that point, and then increases in area to where the fluid escapes. A valve is placed at the junction of the involute and the circle to regulate the quantity of fluid, and vary the degree of expansion. The wheel is surrounded by a casing open to the atmosphere, for preventing condensation of high pressure steam. If a vacuum is to be formed, the casing is enclosed, and connected with suitable condensing apparatus.

[Printed, 4*d*. No Drawings.]

A.D. 1863, October 5.—N° 2429. (* *)

HOEHL, WILLIAM, BRAKELL, CHRISTOPHER, and GÜNTHER, WILLIAM.—This invention relates to rotary engines which act by the momentum of the moving agent. They are adapted to steam, water, or other motor, and consist of inward and outward flow turbine wheels, wherefrom greater efficiency results than can be obtained by a single wheel moving at the same speed. The steam or other motive agent is passed successively through a pair or pairs of turbine wheels in such manner that the succeeding wheel receives the steam as it passes from the foregoing one. The velocity of the fluid in passing through the wheels is much less than when, as in the case of a single wheel, it is allowed to escape direct to the atmosphere or to the condenser, which will be found an advantage, as the effect of high velocity is produced by running at a moderate speed. The wheels are disposed concentrically with each other with an enclosed annular space between them in which the steam enters after having passed the inward flow wheel, whence it passes divergently through the buckets of the outward flow wheel and thence to the exhaust, or if desirable through another pair or series of similar inward and outward flow wheels.

[Printed, 8*d*. Drawing.]

A.D. 1863, October 14.—N° 2518.

CAVALERIE, MARCELIN FRANÇOIS DOROTHÉ.—(*Provisional protection only.*)—Centrifugal motive power.

Two iron balls or discs are attached to the arms of a lever keyed to an axis rotating in two moveable plumber blocks sliding in the direction of the length of the framing. A connecting rod attached to a pivot bolted to the framing is attached to the crank of the axis and a forked connecting rod attached to each side of a fly wheel axis. The fly wheel being set in action causes the intermittent motion of the plumber blocks carrying the axis of the balls or discs which receive circular motion from the blocks and the connecting rod fixed to the crank. The motion of the discs produces a force of traction on the plumber blocks which being added to the motion of the fly wheel the initiating power is suppressed and the machine works from its own centrifugal momentum.

[Printed, 4*d*. No Drawings.]

A.D. 1863, October 17.—N° 2547. (* *)

DARLOW, WILLIAM, and LAWSON, ROBERT HENRY.—(*Provisional protection only.*)—The main body of the apparatus for obtaining motive power consists of a hollow cylindrical vessel, supported on axes, " which acts as an alternating balance lever." Certain compartments in the said vessel are in connection with inclined tubes of the same capacity as their corresponding compartments. The compartments contain mercury, and the tubes are furnished with pistons. The outer ends of the piston rods are connected with a rolling weight supported upon a platform moving on pivots attached to the apparatus.

The apparatus is pulled over on its pivot to a certain point, and the rolling weight is moved so as to overbalance the lever apparatus in one direction. The mercury then enters the inclined tubes, the piston rods are forced outwards, and, by means of certain mechanism, they cause the weight *to come within the influence of an electro-magnet,* which by suitable mechanism assists in carrying the weight over the centre and thus overbalances the apparatus on its pivots in the opposite direction to which it had been previously moved, into its original horizontal position, where its downward movement is arrested by a fixed stop or support. " The mercury then commences to flow from " the inclined chambers back again into the compartments or " reservoirs below, the pistons return to their former position, " tilting the platform and causing the rolling or travelling weight

" to pass back again over the centre so as again to actuate the " apparatus or balance lever on its pivots or axes, and thus repeat " the rocking or oscillating movements thereof in continuous " succession."

[Printed, 4*d*. No Drawings.]

A.D. 1863, October 23.—N° 2620.

PARKER, James.—Steam generated in a boiler is combined with air by discharging it in small jets, each opposite to an air nozzle communicating with a receiver in connection with the valves of the cylinder. Each jet should shoot in the centre of a nozzle. For greater power several jets, about one twenty-eighth of an inch in diameter and arranged in a circle, are used with a larger nozzle. Higher pressure but less air is obtained from small air nozzles. The steam and air may be used in an ordinary non-condensing steam engine or in a vessel with flexible sides made of vulcanized india-rubber cloth made of canvas or other lighter material, and with a moveable flap called the piston. This vessel may be made in different forms with or without fixed central parts or extremities, and with the flexible parts made into distinct bags or fastened to the fixed parts, and the piston may be made to work on a hinge and the vessel made like a pair of double-action bellows. The air and steam may also be used in a press which may be in the form of single-action cylinders with flexible sides. For this purpose the steam and air should be used at a low pressure and temperature, so that little loss may take place by condensation. Where the press has to act for several hours part of the steam may be condensed by passing it through cold water. After being used the steam and air are conducted to the furnace or the ash-pit by which much of the heat will be returned. They may be also passed through gas tar, paraffine, or liquids of a similar nature, the vapours from which will aid the combustion in the furnace.

[Printed, 4*d*. No Drawings.]

A.D. 1863, October 27.—N° 2652.

ATHERLEY, Edmond Gibson.—(*Provisional protection only.*) —Motive power is obtained from an apparatus in two parts connected by a channel and a double balance lever. One part has a cistern which can be depressed by means of a moveable weight,

which when the cistern is at its lowest point is removed by the lever and replaced on rests above the cistern. The cistern is lowered to force pistons which may be attached to the bottom into cylinders to act as pumps or for obtaining motive power. The cistern is raised by levers or weights attached to pulleys; chains passing over pulleys replace the weight on the cistern. The water raised by the pumps passes over a wheel to obtain motive power. The second part consists of a wheel which revolves a quarter of its circumference and places a bucket alternately above and below its axis by which the bucket is filled or emptied. Two weights are fixed at each end of a diameter of the wheel to assist its motion. The weight at the opposite end from the bucket is affixed on a pivot close to the centre of the wheel, and has at its further end a toothed curve parallel to the circumference which gears with a toothed wheel. The arrangement serves to remove the weight from the bucket to the rests above.

[Printed, 4*d*. No Drawings.]

A.D. 1863, November 11.—N° 2806.

RICHARDS, Walter Davis.—(*A communication from Henry Messer.*)—Improvements in caloric engines. These are "making "the walls of the furnace hollow, with projections or reveals "into the space for the purpose of increasing the heated surface." "Regulating the speed by forming a communication between "the air pump and the cylinder in such a manner that when "the engine moves above its normal rate of speed, the regulator "by its action on a valve" "operates to let in all or a portion "of the cold air into the cylinder direct from the air pump." "Arranging a single valve in the passage between the furnace "and air pump" by which air is admitted through or above the fuel. The piston is packed at its upper end only, and has a cup-like elongation at the bottom of which the rod is fastened. The elongation is surrounded by a thin casing and the space between filled with "any suitable non-conductor." The upper part of the cylinder in which the packed part of the piston works is kept cool by "a curvature in the casing" fitted with any non-conductor.

Other improvements consist "in attaching the pump cylinder "to the working piston" to employ the weight of the cylinder to aid the descent of the piston in single acting engines; part of the air is made to pass through the working piston, and it is all

forced into the hollow stationary piston whence it is conducted to the furnace. Regulating the engine by means of a cylinder and piston furnished with a valve, which according to the speed of the engine either allows the air to escape or directs it into a reservoir. Using steam in connection with such engines, and decomposing it by immediate contact with the incandescent fuel, and passing the hot exhaust air through a steam boiler.

[Printed, 1s. 6d. Drawings.]

A.D. 1863, November 13.—N° 2830.

REMINGTON, George.—(*Provisional protection only.*)—Atmospheric railways. The inventor proposes to have steam or other power engines at intervals along the line with a tube or main of the ordinary construction, also a pneumatic engine with a pair of cylinders of larger dimension then in the ordinary locomotive steam engine. These cylinders are connected by a chest or air chamber, to be continually kept open, with the main. In some cases instead of a continuous slit, the main has vents or valves at intervals, the valves to be raised and closed as the locomotive engine passes over them. Disc valves, slide valves, or valves like the keys of a flute may be employed.

[Printed, 4d. No Drawings.]

1864.

A.D. 1864, January 8.—N° 52.

GRAHAM, Alexander Joseph Slade.—This is for "imparting motion to a shaft by causing any fluid or vapour "entering at the circumference of an enclosed vessel or chamber "to act centripetally in gyrations against vanes, arms, or flanches "on that portion of the shaft which is within the enclosed vessel "or chamber, until it escapes by a hole passing along the centre "of the said shaft and open on one or both sides to the atmo-"sphere."

And 2ndly, for a "moveable axle, hollow for the whole or a "portion of its length, and having apertures through the cir-"cumference and between the vanes, arms, or flanches for the "*direction* and escape of the fluid or vapour."

[Printed, 1s. Drawings.]

A.D. 1864, January 9.—N° 59. (* *)

BROOKES, WILLIAM.—(*A communication from Pierre Joseph Guyet.*)—This invention relates to steam and other engines. 1, in regulating by means of the exhaust steam from the cylinder, the quantity of steam, air, or gas admitted to work the pistons of such engines, whereby variable expansion and regularity of speed are produced. An equilibrium valve is affixed in a suitable chest to the steam chest and steam pipe of the engine, and a case called "the exhaust chest" is attached by flanges to the exhaust pipe; within the latter chest there is a diaphragm or disc surface, capable of oscillating on an axis, which carries a lever, communicating with the equilibrium valve by means of a connecting rod; the lever passes outside the chest; one end is weighted and the other works upon a buffer, which may be raised or lowered by hand or, through suitable connections, by the governor. When the engine is in motion, the exhaust steam presses back the diaphragm or disc, which causes, by means of the lever, the equilibrium valve to open and admit steam to the other side of the piston during the exit passage of the exhaust steam. So soon as the force of the exhaust steam is expended, the weight on the lever brings the diaphragm to its normal position and closes the valve, and the steam is cut off for the remainder of the stroke, pending the next discharge of exhaust steam to move the diaphragm and again open the valve. This intermittent motion continues while the engine is at work. 2, consists in an arrangement of cylinders and pistons of steam and other engines whereby the weight and number of working parts are reduced. This engine is composed of two cylinders rectilineally connected to a central casting, containing a hollow axis, on which the cylinders oscillate; the two pistons are fixed on one piston rod, which works through the hollow axis. The piston rod extends beyond the end of one cylinder through a stuffing box, and is connected direct to the crank coupling. The steam is admitted into the hollow axis, and distributed, as the ports by the oscillations of the cylinders, are brought coincident with the supply and exhaust. The regulating apparatus first described may be applied to these engines, which may be either vertical, horizontal, or incliningly disposed; they may be adapted as locomotive, marine, or stationary engines, and when required to work expansively, one cylinder may exhaust into the other, which should be of larger dimensions.

[Printed, 1*s*. Drawing.]

A.D. 1864, January 20.—N° 150.

DE KERCADO, GEORGES THOMAS.—(*Provisional protection only.*)—Improvements in using the motive power of steam compressed air, water, and gases consisting essentially in directing or projecting it on to one or more plates, which are moveable but attached to cups by rods, and are pushed forward by the motive power. In certain cases it might be useful to make the plate turn, in which case it should be made more or less like a turbine.

[Printed, 4*d*. No Drawings.]

A.D. 1864, January 27.—N° 227.

YOUNG, JAMES, and KIRK, ALEXANDER CARNEGIE.—This consists in heating the air used in engines moved by air or other elastic fluid expanded by heat, by exposing it to the surface of vessels or tubes heated by steam. In applying the invention to Stirling's air engine, a vessel or steam jacket is constructed at the upper hot end of the displacing cylinders. The steam enters by a tube and after heating the air is condensed on the upper surface of the plate, dividing the jacket from the cylinder and flows into a groove, and the water escapes by a pipe, and may if desired be returned to the boiler. To increase the heating surface, it is corrugated or covered with annular ridges. In engines in which the regenerator is outside the displacing cylinder, the hot air passes to it through a series of small tubes contained in a chamber to which steam of sufficient temperature is admitted, and after condensation flows off by pipes. Another series of tubes cooled by currents of cold water leads from the regenerator to the lower end of the displacing cylinder.

[Printed, 8*d*. Drawing.]

A.D 1864, February 6.—N° 314.

ECCLES, THOMAS.—(*Provisional protection only.*)—" Wind-" mills."

A number of sails are placed around a wheel whose face may be vertical, horizontal, or inclined. The sails move on pivots, and when they have revolved half a circle are turned by an inclined plane so as to cut the wind with their edges. After revolving for another half circle they are brought by a catch to have their flat sides perpendicular to the wind. The inclined *plane* and catch are moved by a V-shaped sail, so as to preserve

the same relative position to the direction of the wind. When the wind is stormy, the sails are turned edge towards the wind by another sail or sails near the revolving wheel.

[Printed, 4*d*. No Drawings.]

A.D. 1864, February 9.—N° 345.

JOHNSON, John Henry.—(*A communication from Eugene Desrousseaux Hubert.*)—" According to this invention it is pro-
" posed to work a piston or pistons in a cylinder or cylinders
" by means of compressed air expanded by heat before entering
" the valve box, and to employ a portion of the power so
" obtained in forcing fresh air into the main receiver."

The piston end of the working piston is prolonged so as to carry a second piston which works in an air pump and forces air into a receiver furnished with three valves, of which one opens the air passage when the pressure decreases and shuts it when the pressure is sufficient; the second is an ordinary safety valve, and the third is acted on by the governor of the engine in accordance with the variations in speed. The air passes thence through a coil or series of pipes inside a furnace to the valve box. Steam at a low pressure may be used with the hot air to prevent it from causing the piston to grip or fit too tightly the cylinder.

[Printed, 6*d*. Drawing.]

A.D. 1864, February 9.—N° 348.

NEWTON, Alfred Vincent.—(*A communication from James Joseph Gorman.*)—A fixed frame supports an oscillating frame resting on three knife edge bearings. Weights are attached to arms on the moving frame and impart to it a certain momentum. Between the bearings of the frame are guideways on which the wheels of a rolling weight run. When relieved from the weight the guideways are raised up by a spring. The weight assists in moving the oscillating frame by being made by the action of the guideways to rest alternately on the oscillating frame and on a stationary frame. The motion is transmitted by a rod, a pitman, and a dog hinged thereto and provided with two studs in combination with a cam secured to the end of the shaft, a spring acts on the dog, so that whenever the pitman arrives at a dead centre the position of the dog is changed, and thus the dead centre avoided. The spring and dog are combined with a rocker arm and a lever catching on eccentric wrist pins on a disc secured

to the shaft. By changing the lever from one pin to the other the motion is reversed without altering the motion of the frame.

[Printed, 10*d*. Drawing.]

A.D. 1864, March 1.—N° 513.

MOULINE, Louis Eugène.—(*Provisional protection only.*)—This invention consists in introducing into a cylinder heated air from a furnace, and cooling such air by a jet of cold water on one side of the piston. The atmospheric pressure exerted on the other side through the opening of the cylinder, the conducting pipe and the furnace will move the piston while the space left vacant will be filled with hot air, to be in its turn cooled. The cold air and water are driven out through a valve by the momentum acquired by the piston engine. The water required is supplied by a pump, which injects rather more than is necessary to a reservoir containing compressed air, which serves to force the water through tubes into the cylinder.

[Printed, 4*d*. No Drawings.]

A.D. 1864, March 2.—N° 526.

BARLAND, Margaret, and O'KEEFE, Thomas.—(*A communication from Thomas Barland.*)—(*Provisional protection only.*)—It is proposed to propel ships or vessels by "sails attached to "arms from a centre, similar to those of a windmill, but with "the addition of a screen or protector, shielding the sails from "the action of the wind, while they would otherwise be exposed "to its counteracting influence." A series of these sails either in a vertical, horizontal, or oblique position, may be applied to the deck and sides of a vessel, and made to act on a paddle shaft. The lower part of the vessel should be made of a series of floats, with their bows and sterns of fine or sharp lines. These floats should be placed side by side separated by spaces equal to their width.

[Printed, 4*d*. No Drawings.]

A.D. 1864, March 12.—N° 630. (* *)

GEDGE, William Edward.—(*A communication from Emile Bercheron des Essarts and Pierre Jacques Carmien.*)—(*Provisional protection only.*)—"Applying and transmitting motive power "*obtained* from the sea."

The object of this invention is to employ a wave of the sea as a motor. "It is proposed to employ the ascentional power of the "wave by transmitting it to the pistons of a pneumatic engine in "the following manner:—At any point of a beach, or of any "construction built on the sea shore, it is proposed to place an "arrangement of two or more pulleys, on which will roll a cable, "having at one end a buoy and at the other a counterweight, "which may rise and fall in a well made for such purpose. The "pulleys, by the constant come-and-go motion of the wave, which "will at one time lift and at another lower the buoy, may, aided "by connecting rods, act upon the pisons of air-compressing "machines, which will store this compressed air in reservoirs "provided for this purpose, and placed even several miles inland "at the places where the power is required."

[Printed, 4*d*. No Drawings.]

A.D. 1864, April 6.—N° 862. (* *)

SMITH, George, the younger.—This "invention relates to a "peculiar construction and arrangement of rotatory engines to "be worked by steam, air, gas, or water, and consists, according "to one modification, in the employment of a hollow driving "drum provided with end covers or disc plates, which are fitted "upon a driving shaft in such a manner as to allow the drum "and disc plates to have free longitudinal play thereon, whilst "the shaft is carried round therewith. This drum and shaft are "placed eccentrically inside the main working cylinder of the "engine, and a number of slots or openings are made equi-"distant in the surface of the drum, in each of which is placed a "roller, which serves as a rolling and revolving piston. These "rolling pistons are interposed between the internal surface of "the main working cylinder and the periphery of a smaller "drum situate inside the main driving drum, but placed "concentric with the working cylinder, the rolling pistons thus "rolling and revolving between the two surfaces of the working "cylinder and the small internal drum. The steam or other "medium employed in working the engine is introduced and "allowed to escape by two sets of separate and independent "ports or passages, or, if desired, the ordinary arrangement of "ports or passages may be used." According to a second modification, the main driving drum is dispensed with, and cross

grooves or channels are made in the disc plates, for the purpose of guiding the pistons, as they roll between the surface of the smaller drum, and the internal surface of the main working cylinder.

[Printed, 10*d*. Drawing.]

A.D. 1864, April 18.—N° 972.

JOHNSON, JOHN HENRY.—(*A communication from François Montecucco.*)—(*Provisional protection only.*)—A rod hangs from a horizontal rocking shaft and carries a heavy weight constituting a pendulum from the oscillations (maintained by hand) of which power is derived. Two horizontal weighted cross wires are fitted to the rocking shaft. Carriages are propelled by working the pendulum by a crank handle and converting its motion into a rotary one by a rod and crank.

[Printed, 4*d*. No Drawings.]

A.D. 1864, April 20.—N° 991. (* *)

NEWTON, WILLIAM EDWARD.—(*A communication from Frederic Ernest Perret.*)—This invention relates to the construction of equilibrium slide valves, applicable to steam, gas, air, or water engines. The piston, instead of working in contact with the main cylinder is placed and works inside a second cylinder, which is longitudinally movable within the main cylinder, the diameter of which is contracted at each end, where only the surface of the two cylinders come in contact. The inner cylinder has only a limited action imparted to it by an eccentric on the main shaft, and it is this inner cylinder which performs the functions of a slide valve, making, every stroke of the piston, a short stroke, sufficient alternately to uncover and close the inlet and exhaust ports, which are thus brought at the proper time coincident with the supply and delivery passages. The steam surrounds the inner cylinder in the annular space formed between it and the main cylinder, so that the pressure at each lateral point is equalized. The piston operates in the ordinary way in the inner cylinder, and the piston rod works through a stuffing box at the end; the ends of the inner cylinder also work through annular boxes suitably packed.

[Printed, 10*d*. Drawing.]

A.D. 1864, April 22.—N° 1022. (* *)

NEWTON, Alfred Vincent.—(*A communication from Addison Smith.*)—Rotary engine, adapted for forcing air or water, or applying motive power. "Within a fixed cylindrical case fitted with heads which are severally provided with a hollow projecting " eccentric hub, is placed a smaller hollow cylinder. This inner " cylinder is provided at its ends with hollow journals which are " concentric and slightly conical. These journals have their " bearings in conical thimbles affixed to but adjustable endwise " in the hollow hubs of the outer cylinder. Through the inner " or excentric cylinder passes a shaft which is concentric with the " outer cylinder. This shaft is coned at its ends and fitted to " conical thimbles carried by fixed external bracket bearings, and " adjustable endwise therein. The periphery of the inner or " excentric cylinder is fitted longitudinally with rollers which are " slotted and form rocking guides for sliding plates, which plates " constitute the pistons or vanes of the engine, and of which there " may be three or more. Supposing three of these plates to be " used . . . they are set radially round the before-mentioned " shaft that passes through the excentric cylinder, and are of " such length as to extend to and touch the inner periphery of " the fixed cylinder. One plate or vane is bolted to collars keyed " to the shaft, and the others to collars loose on the shaft, the " loose collars being fitted with an oil box to ensure freedom of " motion. Inserted in the fixed cylinder is an adjustable pack- " ing strip, placed longitudinally of the cylinder, and against this " the excentric cylinder is caused to bear. On the outer edge of " each plate or vane is arranged a packing strip or shoe, which " is free to work out radially as the shoe wears away. In the " periphery of the outer cylinder or case induction and educ- " tion openings are made for the passage of the air, water, or " steam, and the projection of the radial plates or vanes from and " their withdrawal within the inner excentric cylinder is effected " by the rotation of that cylinder, which rotation is produced in " the case of a motive-power engine by the pressure of the im- " pelling fluid on the plates." "The guide rollers turn freely in " their socket bearings, and are fitted with spring packing to press " against the sliding plates. The adjustable conical thimbles " allow of endway adjustment of the vanes or plates, and also

"of the excentric cylinder, so as to keep them from grinding "against the heads of the outer cylinder."

[Printed, 10*d*. Drawing.]

A.D. 1864, April 28.—N° 1065. (* *)

PARKER, JAMES.—(*Provisional protection only.*)—This invention relating to the application of steam combined with air as a motive power, and for other purposes, is supplementary to No. 2620, A.D. 1863, and consists :—

1st. In heating the receiver or engine cylinder into which the combined fluid vapour is admitted, otherwise than by the heat of such fluid vapour, so that, by superheating or surcharging the combined vapour with heat, further expansion thereof may be obtained.

2nd. Obtaining "a further increase of motive power by using "the steam and air after it has been once used in a cylinder at "rather high pressure by again combining or mixing the dis-"charged steam and air with other atmospheric air by passing "the steam and air on its discharge from the first cylinder into a "receiver, and from thence through other jets or apertures into "other open air nozzles or pipes communicating with a second "cylinder or receiver in connection therewith, and after it has "been thus used as or to obtain motive power, it is conducted "directly to the furnace or to a receiver or pipes, or channels "leading thereto."

3rd. Obtaining a fresh supply of aerated water, by condensing the combined fluid vapour after it has been used as a motive power in an engine.

4th. Proposes "to use the cooled or partially condensed steam "and air, as motive power in engines with cylinders having "flexible sides."

The invention further relates to the employment of the combined fluid vapour, after it has been exhausted from an engine cylinder, to act as a humid hot blast upon the fuel in the furnace, instead of allowing it to blow off up the chimney, and thereby in the usual way induce a draught of cold atmospheric air through the furnace bars.

[Printed, 4*d*. No Drawings.]

A.D. 1864, April 29.—N° 1085.

HARVEY, JOHN.—(*Provisional protection only.*)—Motive power *is obtained* from a cylinder having a central fixed disc and two

moveable discs or pistons joined by a rod passing through the fixed disc. A mass of tow, cotton, or fibrous absorbent material is fixed on each side of the central disc, and a supply of petroleum, spirits of wine, oil, naphtha, turpentine, or other rapidly combustible hydro-carbon is conveyed by a pipe to the upper or lower chamber according to the position of the piston, and is ignited by a small lamp or jet of flame. The lower piston in rising tends to create a vacuum in the lower chamber which is filled up with water from a suction pipe directed in vessels to the bow. The water is afterwards forced out by a water pipe directed in vessels to the stern. The same apparatus may be applied to pumping water to any desired elevation or by lengthening the piston rod and connecting it with a crank to driving machinery.

[Printed, 4d. No Drawings.]

A.D. 1864, April 30.—N° 1099. (* *)

BOULTON, Matthew Piers Watt.—(*Provisional protection only.*)—The object of this invention, in connection with the mode of working steam and caloric engines, is to employ that portio of the heat which is generated by the combustion of the fuel, and which is ordinarily wasted and carried off through the flues to the chimney. The following method is employed :—A force pump is worked by the engine which forces the air into the furnace or combustion chamber, and thence "onwards into the " water contained in the boiler. The heated gases after issuing " into the water are made to pass through a number of small " orifices, and so to rise in numerous currents through the water, " communicating heat to it in their passage as the bubbles of " steam do in rising through the water in an ordinary boiler. As " the air is forced through the force pump at the ordinary tempe- " rature of the atmosphere, while when it acts on the piston its " temperature is much higher, there is gain of power in this " part of the process. In fact the engine is a combination of the " steam engine and the caloric engine." Any description of solid, liquid, or gaseous fuel may be used, and particular arrangements provided for their combustion.

[Printed, 4d. No Drawings.]

A.D. 1864, May 3.—N° 1112. (* *)

BOULTON, Matthew Piers Watt.—(*Provisional protection only.*)—This invention relates to a mode of obtaining motive

power by the combustion of fuel, and consists in utilising the expanded gases generated during its combustion. For this purpose, the air and gases, which pass through the chamber wherein combustion takes place, are first made to actuate an engine, whence they issue into a flue, and communicate heat to the water in the boiler of a steam engine. The heated gases may be employed to work the piston of a caloric engine, or to actuate mechanism on the principle of the turbine, to effect which, air may be forced into a chamber where ordinary fuel is burnt, or aeriform matters in inflammable proportions, such as a mixture of air or oxygen with hydrogen, carburetted hydrogen, carbonic oxide, vapour of petroleum, vapour of naphtha, or with vapour of oils generated either by heat, electricity, or chemical action; and inflammable gas may be employed to operate engines, contrived for the purpose of being worked by the explosion of gas mixed with atmospheric air, the heated products being afterwards employed to impart their heat to water in the boiler of a steam engine.

[Printed, 4*d*. No Drawings.]

A.D. 1864, May 7.—Nº 1160. (* *).

HANDCOCK, Elias Robison.—(*Provisional protection only.*) —This invention relates to rotary engines to be worked by steam or other motive power. The outer rim of the engine cylinder "is "of a hollow annular form, into which steam is admitted from "the boiler through a steam stop, which also serves as a fulcrum "for the steam to abut against. In this hollow annular cylinder "pistons are inserted, against which the steam acts, and as this "annular cylinder is attached to the shaft or axle much in the "same manner as an ordinary fly wheel, a rotary motion is "imparted to the machinery."

[Printed, 4*d*. No Drawings.]

A.D. 1864, May 9.—Nº 1173.

WENHAM, Francis Herbert.—"Engines worked by explosive "mixtures."

Two pistons, one working a crank, are contained in a cylinder with open ends. The second piston is made to follow close to the first by atmospheric pressure till near the end of the stroke, when they are separated by a stop on the second piston rod. A mixture of air and gas or explosive vapour is introduced between the

pistons and exploded by a flame drawn in through a touch-hole uncovered by the first piston. The second piston is then driven to the opposite end of the piston valve, it is held fast by wedges driven into the cross bar against the side of the rod. A partial vacuum is formed between the pistons, and the atmospheric pressure causes the first piston to move up to the second and to drive out the products of combustion. The jet of flame is contained in a cage of platinum or other metal, and a similar arrangement is fixed round the touch-hole. These act as heat retainers, becoming red hot and so prevent the flame being blown out.

A double-acting cylinder with closed ends and a single piston may be worked by explosive mixtures admitted at each end of the cylinder. The pressure caused by the explosion acts to drive forward the piston, and the resulting vacuum aids its return.

[Printed, 8*d*. Drawing.]

A.D. 1864, May 14.—N° 1227. (* *)

NEWTON, William Edward.—(*A communication from John Jones.*)—This invention relates to rotary engines, which, it is stated, in consequence of the peculiar construction of the valves, are of the simplest description that will operate by the pressure of steam or gases. The engine consists of a cylindrical case, within which, concentrically mounted upon the central axis or shaft, is a cylindrical piston block or drum, which fills the cylinder to the ends lengthwise, but leaves an annular space between its periphery and the internal surface of the cylinder, along which two recesses are formed to receive the valves; along the surface of the cylindrical block a projecting piece is fitted, the sides of which in section converge towards each other in gentle curves from the periphery of the block to the apex of the projecting piece, where it is fitted with a packing strip which, when the engine is in motion, slides round in steam-tight contact with the internal surface of the cylinder. This projecting piece acts as the piston, and as it is driven round by the steam, a rotative movement is imparted to the central shaft. The valves are near together and act right and left for the inlet and exhaust; they are lifted by the curved sides of the piston piece and returned by springs. The working face of each valve is suitably bevelled and furnished with packing, which acts against the periphery of the revolving piston block.

[Printed, 10*d*. Drawing.]

A.D. 1864, May 24.—N° 1291. (* *)

BOULTON, MATTHEW PIERS WATT.—This consists in improvements in engines worked by heated air or gases mixed with steam; it is also applicable to compressing air and other aeriform fluids. A combustion chamber is employed, wherein inflammable gas, vapour, or other fuel is burnt, the products from which possess great expansive force. A boiler is employed in which steam is generated. The heated gases and vapours issue from the combustion chamber into a receiver, where they commingle with the steam which enters from the boiler; or the heated gases and vapours may, through suitable passages, be conducted into the steam space of the boiler, and there combine with the steam, which combination is employed to work an engine. The exhaust passages conduct the vapours (which still retain considerable heat) from the engine to the boiler furnace, where (being inflammable when mixed with air) they are employed to generate the steam; they are also partially employed to generate inflammable vapour from petroleum, naphtha, or oils, which vapour is used in the combustion chamber as fuel. The air is forced into the combustion chamber by a pump, and the engine is started by the steam from the boiler, whereby the forcing apparatus is set in motion, combustion taking place under pressure within the chamber, which, as also the vessels connected with it, consist of strong pressure bearing metal casings lined with fire-brick.

[Printed, 1*s*. Drawing.]

A.D. 1864, May 30.—N° 1339. (* *)

HUGGETT, JOHN.—Rotary engine, also applicable as a pump or gas exhauster. It consists of a cylinder or case having fitted longitudinally through its centre the main shaft, concentrically upon which within the cylinder is fixed a solid boss which extends internally from end to end, abutting against the covers which are fitted with stuffing boxes through which the shaft revolves. The boss within the cylinder is partly surrounded by a circular space, and partly by solid metal, against which it works. These forms are concentric with the shaft, on the opposite sides of which, the ends of the inner circle formed by the solid metal diverge and unite with the outer circle and so form suitably curved piston guides. The piston plate which extends from end to end, works in a longitudinal mortice through the shaft and boss, and is

caused to slide diametrically to and fro in the mortice by the curved guides, which are so fashioned, that the longitudinal edges of the diametrical piston plate, whilst sliding through the shaft and boss, are always in contact either with the extremity of the two radii or with the curves. The steam admission port is on one side of the boss at one extremity of the space, and the exhaust port at the other; by sending the fresh steam through the exhaust passage, the direction of motion may be reversed.

[Printed, 8*d*. Drawing.]

A.D. 1864, May 31.—N° 1350. (* *)

STANLEY, John Martin, and STANLEY, Jabez.—This invention relates to apparatus comprising, 1st, a rotary engine, to be worked by steam or other elastic fluid, and 2nd, a similarly formed engine, capable of being used as a water mill or hydraulic engine, for moving, raising, or forcing water, exhausting, compressing, or blowing air or fluids.

The rotary engine consists of an inner revolving cylinder, which is mounted or fixed upon a horizontal central axis or shaft, which passes so far eccentrically through the ends of a fixed cylindrical outer case, as to bring the periphery of the inner cylinder against one part of the internal surface of the case, which is there fitted longitudinally with a packing strap, against which the surface of the inner cylinder revolves in constant steam-tight fractional contact, so that at all parts of the revolution a crescent formed space exists between the inner cylinder and the case. Stuffing boxes eccentrically fitted on the ends of the case, act as bearings for the shaft. Diametrically through the inner cylinder and through the shaft there is a longitudinal narrow mortice or opening, which extends towards the ends of the cylinder, and in this mortice a plate piston, suitably packed, is fitted to slide diametrically with its ends in constant contact with the inner surface of the case, the configuration of the transverse section of which, is necessarily caused slightly to deviate from a true circle. Ports or apertures, for the steam and exhaust, open into the case on each side of the packed line of contact between the case and the inner cylinder. The passage of the steam through these ports is regulated by a valve, and in accordance with the required direction of motion, they are made to answer respectively either for the induction of the steam or for the exhaust.

[Printed, 10*d*. Drawing.]

A.D. 1864, June 10.—N° 1445. (* *)

JAMES, WILLIAM HENRY.—This invention relates to a motive-power engine actuated by high-pressure steam combined with compressed air. Two single action cylinders acting on one crank shaft, the throws of which reciprocate motion on the same plane at opposite sides of the shaft, are shown and described. The length of stroke is unusually long, in order to carry the pistons into perforated prolongations of the cylinders at the end of the upstroke of each. By this arrangement the atmosphere is admitted into the cylinders underneath the pistons respectively, and is compressed as they return and finish their downward stroke, after which the lower ends of the cylinders have capacity left to contain the compressed air, amongst which, simultaneously with the finish of the stroke, the high-pressure steam is admitted and commingling therewith, the reactive power of the air is increased by the additional expansibility it obtains from the high temperature of the steam, the force of the combination acting expansively upon the pistons to produce the up stroke. The valves are operated by the pistons, which at the end of their strokes respectively strike the tail ends of and open the inlet valves. It is proposed to pass the exhaust from the cylinders into the boiler furnace to assist in the combustion of the fuel. Stop-cocks or slide valves, actuated by eccentrics or otherwise, may be substituted for the inlet valves for the purpose of introducing the steam.

[Printed, 8*d*. Drawing.]

A.D. 1864, June 16.—N° 1492.

YOUNG, SAMUEL.—(*Provisional protection only*.)—Weights in the form of governor balls are connected to a slide which presses on one end of a series of bell crank levers, and causes another lever to slide or move a cylinder along a key-way on a crank shaft, which causes the ends of two levers to act against a diagonal rib on the cylinder, and to effect the revolution of the cylinder and crank shaft. The opposite ends of these levers move a sliding block or spring connected by a rod to the shaft, whence the balls receive motion. When the power of the engine is beginning to be spent, the weight of the balls falling *and pressing* the levers maintain the working power.

[*Printed*, 4*d*. No Drawings.]

A.D. 1864, June 23.—N° 1578.

HENRY, MICHAEL.—(*A communication from Louis Dominique Girard.*)—(*Provisional protection only.*)—This is an air engine having a force and pressure pump; a double receiver consisting of a cylindrical portion, in which work two displacing pistons fitted to the same rod; two regenerators, one placed before the mouth of each receiver; and two heaters and a working cylinder. The displacing pistons are moved by fresh volumes of air forced in by the pump at one end of one of the heads of the receiver. The air at the opposite end of the other head is then forced through the regenerator into the heater, and thence partly into the receiver at the other side of the displacing piston, and partly into the working cylinder. The exhaust air passes through the regenerator into the furnace.

[Printed, 4*d*. No Drawings.]

A.D. 1864, June 25.—N° 1599.

STEVENS, BENJAMIN FRANKLIN. — (*A communication from Simon Stevens.*)—Applying petroleum.

Crude or refined petroleum oil, coal oil, or other similar substances, are vaporised in a suitable vessel, and air or air and steam are mixed therewith, and the mixture is used for (among other purposes) operating engines by a combustion effected in the cylinder of the engine, or in a separate combustion chamber. Where it is desirable to keep the temperature of the cylinder low, the products of combustion are passed through a strong vessel containing water. The pressure of the mixture of the hydrocarbon vapor and air as it enters the combustion chamber must be at least equal to that to be exerted on the piston. The difficulty of packing the pistons, and the difficulty arising from soot and ashes are avoided by the arrangement.

[Printed, 6*d*. No Drawings.]

A.D. 1864, June 30.—N° 1636.

BOULTON, MATTHEW PIERS WATT. — Improvements in obtaining power from aëriform fluids. When highly heated fluids are used, a cylindrical vessel containing water is placed within, but not so as to touch the cylinder below the piston. The heated fluids are admitted between the sides of the vessel and the cylinder, and act on the piston, but are prevented from

rising above it. The rod and packing can thus be kept cool and well lubricated. The water is supplied through the piston rod or some rod attached to the piston, and the vapors generated may be utilised or discharged. Valves are formed of vessels containing water, and having their sides protected by a badly conducting substance. A second valve, not fitting accurately, may be used to obstruct the communication of the heated gases with the principal valve. When heated gases are used in a chamber, steam may be introduced so as to form a thin layer or film between them and the vessel, which is thus kept cool. Heated gases are forced into combustion chambers from the generating chamber, and after being burnt, the heat may be reduced by injecting steam, or by making the products pass through water in numerous small streams made to take a zig-zag course by metallic surfaces. Air is forced into the combustion chamber by liquid worked by the pressure of steam, or by steam caused to issue by a jet into a larger tube, where it becomes contracted by cooling, and combines with and forces along a current of air. The air may be freed from the steam by precipitation or causing the mixture to pass through water. The heated gases which have been discharged after working a piston may be employed to drive a turbine, fan, or similar instrument, which may be immersed in water, which is required to be heated to utilise the heat generated by the friction and velocity and the issuing fluid. Where gases are used to work a turbine, the velocity of the turbine may be diminished by making the gases act as a blast, and set in motion a current of air in conjunction with them.

[Printed, 1*s*. Drawing.]

A.D. 1864, July 5.—N° 1664. (* *)

MESSER, Henry.—This invention, relating to "caloric or "heated air engines," is supplementary to a prior invention, No. 2806, A.D. 1863. The present invention consists, 1, of additional details of construction, and the so arranging such engines that the lower part of the cylinder, the air pump, and the furnace are mounted on one horizontal plane which reduces the height, and affords facilities for disposing the fuel feed box *over* the fire-box, so that when the communication is opened, *the fuel will* deposit itself upon the fire. 2. In passing the air

in its course from the air pump to the furnace, through an annular passage formed around that portion of the length of the working cylinder contiguous to where the packing portion of the piston works within; this arrangement is to prevent the over-heating of that part of the cylinder, while the caloric carried off by the air current is conveyed to the furnace and saved. 3. In partially filling the intervening space between the furnace bottom and the bed plate with water, wherefrom steam is generated by the heat of the surrounding surfaces; this steam may be either used to assist combustion in the furnace or as a source of power. The bottom of the cylinder may be in contact with the water and kept cool thereby. 4. Relates to the construction of the furnaces and grates of heated air engines, and to various modes of passing and distributing the air therein which is supplied from the air pump. 5. Relates to the construction of the air pump, air passages and valves; the latter open upwards, and close by their own gravity without springs or weights, thus rendering them less difficult of operation. 6. Relates to the piston packings, springs being interposed between the cup leather and the piston head, so as to press divergently on the cup packings. 7. Relates to the construction of the furnaces, and to the use therein of hydro-carbonaceous fuel, such as petroleum or other inflammable fluid of like character, either alone or in combination with solid incandescent fuel; also, to the mode of injecting the fluid by a force pump, in quantities regulated by the governor of the engine.

[Printed, 10*d*. Drawing.]

A.D. 1864, July 13.—N° 1741.

COUGHIN, THOMAS TOWNSEND.—(*Provisional protection only.*) —Motive power is derived from air compressed by a series of pumps into receivers in which the amount of compression regularly increases, each receiver but the last serving to supply the next pump. The air is distributed through pipes to engines in factories or otherwise. The pumps are worked by a shaft provided with toothed wheels. The teeth of the wheels actuating the pump increase in number as the pressure of the air increases, by which the pumps are made to act more slowly. The diameters of the pumps decrease progressively.

[Printed, 4*d*. No Drawings.]

A.D. 1864, July 20.—N° 1809.

LAUBEREAU, JOSEPH.—This engine consists of a vessel divided into two chambers by a moveable partition fixed to a rod and filled with plaster of Paris, and having the surface covered with an elastic cushion formed of textile materials. The lower part of the vessel is hollowed to form the cap of a chamber which receives the flame of a furnace. The upper part is surrounded by a case through which cold water is constantly pumped by a pump in which a diaphragm is moved backwards and forwards by the alternate contraction and expansion of the air in the chambers. Such alternate expansion and contraction is caused by the motion of the partition and works a piston and cylinder. The crank which works the partition is about one-third of a revolution in advance of the cylinder crank. An atmospheric self-acting valve is placed in the cold chamber to supply the loss from leakage. The engine may be used to raise liquids by increasing the size of the pump which supplies cold water to the casing of the cold chamber.

[Printed, 1*s*. 2*d*. Drawings.]

A.D. 1864, August 13.—N° 2025. (* *)

PILLINER, ALFRED COLERICK, and HILL, JAMES CHARLES. —This is an invention of apparatus for obtaining motive power, and measuring, raising and forcing fluids. It consists of "two or "it may be more toothed wheels, or two rolling curves; one of "the wheels or curves is fixed on the main or driving shaft, and "is called the 'driver,' and the other or others are geared into it, "and called the follower. We enclose these in a chest or case "properly bored out, so that by suitable packings on the apexes "and sides of the teeth the wheels revolve steam or fluid tight in "the said chest or case. Steam or fluid under pressure is admit-"ted into the case through an opening at its side opposite to "where the two wheels or curves gear or roll together, and on the "opposite side of the case an opening is made through which the "steam or fluid may pass away."

The motive power is to be given off the axle of the "driver" wheel by means of a pulley, and by causing the steam to enter through the exhaust port the motion of the apparatus may be reversed. When used for forcing, measuring, or raising fluids, power from another engine must be applied to the pulley on the *driving* shaft.

[*Printed*, 1*s*. 4*d*. Drawing.]

A.D. 1864, September 2.—Nº 2154.

HEWES, James Thomas.—(*Provisional protection only.*)—
" Wind engines."

Two, three, four, or more horizontal arms are placed at the upper part of a vertical shaft. "The extremity of each arm is " furnished with an upright spar or mast secured to the arms by " the middle of such spar in a loose manner, so that it may play " freely when acted on by the wind. This spar is furnished with " a square or other sail both above and below the arm."

[Printed, 4*d*. No Drawings.]

A.D. 1864, September 2.—Nº 2160.

BARLAND, Margaret. — (*A communication from Thomas Barland.*)—This is for the application of windmill propulsion to sailing vessels.

In a long and narrow ship a mill is placed at each end. They have their centres of rotation joined by a common axle parallel to the line of the ship, with four sails at right angles. The axle should be supported by standards. "These posts might be erected " as perpendiculars to beams crossing from side to side of the " ship, and from the ends of these beams others might rise " slanting to the tops of the standards, thus forming isosceles " triangles with perpendiculars from the apices, such being one of " the strongest kinds of construction."

With a view to side impulsion, a screen is arranged with its lower edge outside the bulwarks and slanting towards the axle. The sails are screwed round to face the wind, and the part above the screen is acted on both by the direct action of the wind and the current directed by the slant of the screen. In order to have a very wide ship with as little resistance as possible, a series of floats and escape passages is used. The floats may be made in several different forms, but should be from fifteen to thirty times as long as they are wide, and should have escape passages of the same width between them.

The power of the windmill is best used to pump water into a tank from which it is allowed to escape by two, three, or more of eight tubes according to the direction in which the ship is to move.

[Printed, 6*d*. No Drawings.]

A.D. 1864, September 12.—N° 2225. (* *)

KNAB, David Clovis.—This invention relates to a mode and apparatus for obtaining motive power by the expansive action of steam, and other elastic fluids, directed against surfaces submersed in a bath of liquid metal. The apparatus consists of a wheel or disc mounted on a horizontal driving shaft and furnished with buckets similar to a water wheel: this wheel is enclosed in a case, the lower half of which closely surrounds the wheel, leaving rather more than sufficient space for the edge of the revolving buckets to clear. The upper part of the case is hermetically closed by a cover; about two-thirds of the circumference of the wheel, inside the case, is surrounded with liquid metal (such for example as D'Arcet's metal) which is an alloy of lead, tin, and bismuth, fusible at a low temperature; the lower half of the case is encompassed by a flue, which is heated by a small furnace underneath and serves to keep the metal in a liquid state. The team pipe enters at the upper part of the case and passes downwards, within the space between it and the wheel, to beneath the vertical line of the axis, where it terminates with an open end, turned up so as properly to direct the flow of steam into the buckets. The steam is generated in a boiler conveniently near; it acquires an equable temperature with the fused metal while descending through it in the pipe. The force of the steam displaces the metal from within the buckets, as they in succession pass under the centre, and as they rise with the rotation of the wheel, there is the constant pressure of the weight of the metallic medium underneath the steam, tending to raise the buckets, whereby the wheel is kept in motion. Through a pipe which opens out of the cover, the spent steam escapes, as the buckets in succession rise to the surface of the metal. When air is employed instead of steam, it is heated in an apparatus contained in a vertical cylindrical chamber, which combines a furnace for heating the metal and the air, and a motive-power engine. A circular furnace is concentrically fitted within this chamber, so as to leave a surrounding annular space, which is closed at bottom and contains the liquid metal The cold air is forced by a pump through the furnace in a pipe wherein it becomes heated; this pipe passes up through the crown of the furnace and discharges the heated air underneath an inverted hollow piston, which works *above the f*urnace in the upper part of the cylinder and dips into

the liquid metal contained in the annular space surrounding the furnace. When the up-stroke is completed, the air is exhausted by the action of the pump and cooled by suitable means, the piston then descends ready for the next stroke, "and so on alternately."

[Printed, 1*s*. Drawings.]

A.D. 1864, September 16.—N° 2272.

COLOMBE, LOUIS.—(*Provisional protection only*.)—Continuous rotatory motion is derived from a wheel with a series of curved tubes commencing near the axis of the spindle which carries the wheel, and which are gradually enlarged until they approach the edge of the wheel. A chamber at the spindle end of the tube is opened and closed by a flap acted on by the motion of the wheel. Two circular weights or counterbalances are placed in the tube, one being retained by the flap within the chamber, while the other gives motion to the wheel. When the wheel has revolved as far as this weight will carry it, the valve drops and sets free the other weight which acts then on the wheel as the first.

[Printed, 4*d*. No Drawings.]

A.D. 1864, October 5.—N° 2451.

BROMWICH, BRYAN I'ANSON.—(*Provisional protection only*.)—Improvements on No. 261, A.D. 1863, to remedy the defects arising from leakage. A series of hollow rings are fitted with air-tight cases free to rotate on their seats. The bottom plates of the rings have two grooves, "in which are placed vulcanized india-"rubber tubing or other springing material, above which is a "smooth loose ring of steel acting as a receiving way for the "moving cover; or the grooves may be filled with oil or other "lubricant that will prevent the escape of air." A piston fitting the case is attached to each cover and is driven round by compressed air. The rotating covers move a common shaft and are connected by coupling tubes. The air passes successively through the engines and then into an elastic coiled pipe connected with the air chamber. A roller driven by the central shaft expels the air from this pipe and into the pipe supplying the first or highest ring or engine.

[Printed, 4*d*. Woodcut.]

A.D. 1864, October 10.—N° 2494. (* *)

HUCH, Edward Heinson, and WINDHAUSEN, Francis.

This invention relates to machinery for obtaining motive power, by the expansive conjoined forces of heated gases and steam. The engine comprises a vertical cylinder and a truncated piston, to which the lower end of the connecting rod is jointed, the upper end being coupled direct to the crank shaft above. The trunk end, attached to the upper side of the piston, forms an annular space between itself and the cylinder, and works out through an annular packing in the cylinder cover; in this annular space steam operates upon the piston. The outside of the hollow trunk end, attached to the under side of the piston, fits and slides against the sides of the cylinder; this trunk end descends into an annular recess formed by a cylindrical water chamber concentrically disposed at the bottom of the cylinder, through which, rising concentrically up from below the cylinder end, is a tubular passage which opens within the trunk above the water chamber. Through this passage the heated gases evolved in a contiguous furnace are caused to flow in regulated quantities by means of a distributing valve interposed below the cylinder. The up stroke of the piston is produced by the admission of the heated gases into the lower trunk beneath it, where also the exhaust steam from the annular space above (after having operated above the piston for the downward stroke) finds its way, and commingling with the heated gases is regenerated. The exhaust passage opens at the completion of the stroke to the condenser, which is combined with a steam generator. It consists of an upright cylindrical chamber, closed at both ends respectively by a tube plate; it contains an inner cylinder of much smaller diameter which is attached to and open at each end through the tube plate. The annular surrounding water space is filled with vertical tubes, through which the gases exhausted from under the piston are directed, whereby steam is generated for operating above it. The inner cylinder is furnished with a series of shallow dishes, formed circular and annular, alternately fixed in the centre and to the sides. The cold water enters through a central tube attached to the cover and falls amongst the gases (rising from the tubes of the generator) into the upper central dish, whence it flows in showery particles over *the edge* into an annular dish; from this receptacle it falls over *the inner* edge into the next, which is a central dish, and thence

into an annular dish and so on to the bottom, mixing with and condensing the exhausted gases on their way to the air pump, which is single acting. The working parts generally are kept cold by water contained in casings, and the distributing valve is furnished with a passage for a cooling water flow. All the passages and cooling water flow are in communication with the generator. The constructive details of the invention are susceptible of various modifications.

[Printed, 1*s*. Drawing.]

A.D. 1864, October 20.—N° 2596. (* *)

NEWTON, William Edward.—(*A communication from Jean Joseph Molard.*)—This invention relates to that class of rotary engines, worked by steam, gas, air, or other elastic fluid, known as direct-action rotary engines, or as disc engines. "The body or " cylinder of the engine, which is made hollow, is mounted and " rotates in bearings at its extremities, the extremities themselves, " which are made smaller than the middle, forming the trunnions. " In these hollow trunnions the induction and eduction pipes " are situate. The driving piston (which consists of a hollow " sphere, provided with a disc and a wing, or partition, to be " acted upon by the motive fluid, and having two openings for the " admission and emission of the motive fluid), is mounted inside " the main cylinder at an angle to it, the axles of the piston " resting upon recesses made for that purpose in the supply and " exhaust pipes at each side. The middle of the cylinder is made " in the form of a pulley, for the double purpose of receiving " the piston, and also of transmitting the motive power to any " machinery to be driven. It is hollow, and its sides are inclined " inside, for the purpose of allowing the piston to be set at an angle " to the body of the engine. It will now be understood that " upon steam or other motive fluid being supplied by the pipe at " either end (according to the direction in which the engine is " required to rotate) it will enter the hollow spherical piston, and " in making its exit therefrom will impinge upon the partition " or wing of the piston, and will thereby cause the cylindrical " body of the engine to rotate in its bearings, which rotary motion " may be communicated to any machinery to be driven by adapting " a driving band to the pulley-formed cylinder, or by providing " such pulley with cog teeth, or any other suitable means for

" transmitting motion." A modification consists in making the body of the engine stationary and the piston to rotate. For working steam expansively two engines, one smaller than the other, are arranged to act conjointly upon one shaft; the steam after operating in the small engine, exhausts into the other or larger engine where it works expansively, and then passes on to the condenser.

[Printed, 1s. Drawings.]

A.D. 1864, October 24.—N° 2629. (* *)

SCHORB, GEORGES.—This invention relates to a "rotary engine " actuated by the double action of steam or any other moving " fluid." The cylinder of this engine, unlike others of its class, revolves round a fixed piston; portions of its inner surface are removed by forming four longitudinal recesses, each one in relation to the others at right-angles with the centre, or 90° apart; these recesses receive four resistant flap stops, which operate similar to the action of a flap valve and which, in succession as the cylinder revolves, are forced by springs across the annular space between the cylinder and the piston. The extreme length of radii of one diameter of the piston corresponds with the internal diameter of the cylinder, the other radii, at right angles with the former, are much shorter, so that a space narrowed by the somewhat elliptic configuration of the piston, which is curved divergently in either direction so as to unite the shortest to the longest radii, is left on opposite sides between the piston and the cylinder; the constant action of the springs upon the axes of the resistance flap stops, tends to press their free edges, which carry packings, constantly against the periphery of the piston, the form of which keeps them in the required position and presses them into their respective recesses while passing its longest radii. A constant admission of steam is simultaneously entering the space on each side of the piston, so that it operates at the same time on opposite sides in succession, during a quarter of a revolution, upon the revolving resistant flap stops, and intermediately exhausts. All the moving rubbing surfaces are furnished with metallic packings, to receive which the bottom and cover are concentrically grooved; springs and screws are used to press the packings up to the surfaces against which they rub. "Double action" means the con-

stant action of the steam upon the two opposite resistant surfaces at one and the same time.

[Printed, 1s. 4d. Drawings.]

A.D. 1864, November 4.—N° 2738. (* *)

BOULTON, MATTHEW PIERS WATT.—(*Provisional protection only.*)—The invention relates to obtaining motive power from steam, aeriform fluids, and liquids, having for its object the use of such fluid or fluids at a high degree of temperature. Several methods and arrangements of construction are described. The first consists in admitting steam or vapour into the upper part of a cylinder, in which a piston works vertically. "Attached to this " piston on its upper side is a cylindrical body nearly fitting the " cylinder, but not touching it; and between this inner cylindri- " cal body and the cylinder is liquid whose boiling point is higher " than that of the vapour employed. This cylindrical body is of " greater length than the stroke, so that the piston and the lower " part of the liquid never come in contact with that part of the " cylinder with which the heated steam or vapour comes in con- " tact. The upper part of this liquid is heated by the vapour " which comes in contact with it and may be heated by other " means so as to be kept somewhat higher in temperature than " that vapour, whilst the lower part is kept cool by conduction " from cool liquid, so as to have a temperature at which a piston " can be worked without difficulty in a cylinder. To impede " circulation of this liquid, liquids of two specific gravities may be " employed, the heavier being at the bottom. The heat abstracted " from the liquid for the purpose of cooling it may be utilized by " employing it to heat the liquid made use of in the boiler, or to " generate inflammable vapour, which may be used as fuel. " Two pistons of this kind may be employed connected with the " same axle or machine, one performing work while the other " makes the return stroke. And any number of such pistons may " be employed to work a common axle, or give motion to one " machine. A piston of this description may be employed as the " rod of a valve." The valves employed slide horizontally and when closed are surrounded with liquid, so that the aeriform fluid cannot find a way between the valve and its seat; the liquid is displaced before the valve opens. Other valves and vessels for operating highly heated fluids are described.

[Printed, 4d. No Drawings.]

A.D. 1864, November 11.—N° 2803. (* *)

CLARK, WILLIAM.—(*A communication from Constant Jouffroy Duméry.*)—This invention relates to means and apparatus for producing motive power, which consist of a steam generator combined with arrangements for employing the power developed by the expansion of the air which passes through the furnace as an auxiliary to the steam power for rendering independently such services, as 1, the introduction and expulsion of the air necessary for combustion, 2, working the feed pumps, 3, operating the mechanical arrangements for feeding and raising the fuel on the furnace grating; 4, effecting the circulation of air and water necessary for the partial surface condensation of the steam, 5, agitating and producing a circulating flow of water over the heating surfaces in the boiler, and 6, conveying and utilizing the gaseous heat which usually passes off to the chimney. The boiler or generator consists of two vertical cylindrical chambers united by a flue tube surrounded by water space; the largest chamber contains a central furnace surrounded by water space. The ash-pit underneath the furnace is closed and cold compressed air is introduced through a suitable pipe beneath the furnace bars; the fuel is fed and raised to the level of the fire-bed by mechanical connections with the crank shaft of the auxiliary air engine. The smaller cylindrical section of the boiler contains a group of vertical flue tubes which open into a lower chamber, whence the heated air passes to the engine at a temperature regulated by the passage of the air through tubes surrounded by the boiling water. The water is fed to the small section of the boiler, wherein it is maintained at a higher level than in the furnace section, which is supplied from the other by an overflow pipe. The poker or instrument for stirring or regulating the fire is introduced into the furnace under pressure through a metal sphere contained in a hollow spherical socket, so that it can be moved in any required direction without causing any escape of the gaseous heat. Orifices are provided for inspecting the interior of the apparatus when in operation.

[Printed, 1*s*. 10*d*. Drawings.]

A.D. 1864, November 18.—N° 2890.

JONES, EDWARD STEWART.—(*Provisional protection only.*)—*Motive power* for the propulsion of ships is obtained by com-

pressing air or other incondensible elastic fluid at high pressures into spaces or containers which may advantageously consist of a number of cylindrical vessels, which, when in position, resemble a honeycomb, and each one or each section of them should be provided with suitable pipe connections and valves. The air or fluid is pumped in by employing small steam engines or other power when the vessel is in port or on a voyage, so as to have it stored ready for use whenever required.

[Printed, 4d. No Drawings.]

A.D. 1864, November 22.—N° 2918. (* *)

BRISBANE, THOMAS MAKDOUGALL.—This invention relates to a duplex compound cylinder engine, to be worked by steam or other fluid. Two double cylinders are disposed on the same plane, and fixed together side by side; they are first, cast in single cylinders, and fitted with pistons and rods in the usual manner; they are then united in pairs by the bottom flanges, so that the piston rods work rectilineally to and forth at the opposite ends, and are coupled to crank shafts, which are disposed at right angles therewith on the same plane as the axis of the cylinders; these shafts are supported by and revolve in coupled bearings, formed equidistant from their centres on the ends of two beam levers, which are disposed parallel with and on the same plane as the cylinders and the crank shafts. A main driving shaft, parallel with the crank shafts, passes at right angles through the centre of the levers, which are firmly secured thereon. This main shaft also passes transversely through the cylinders which oscillates thereon, and are suitably formed and transversely bored between the bottom flanges to receive the shaft. Outside the levers, the main shaft rests in side bearings, supported by suitable framework; firmly attached to the inside of the framing, around each side bearing and concentric threwith, is a stationary toothed wheel or ring, into which tooth wheels on the ends of the crank shafts are geared. The steam is supplied to the cylinders through the main shaft, which at each end is provided internally with suitable passages for the supply and exhaust, and the ports are uncovered and closed by the oscillating movements of the cylinders, without any operating valve gear. When the steam is turned on, the cranks by revolving cause the cylinders to oscillate, at the same time that the toothed wheels on the ends of

the crank shafts revolve respectively round the fixed gearing, whereby the whole arrangement is started into rotary action, causing the central main shaft to revolve therewith, whence power is given off for operating windlasses, cranks, and other apparatus on board ship or elsewhere, or for other purposes.

[Printed, 10*d*. Drawing.]

A.D. 1864, December 5.—N° 3023.

YOUNG, SAMUEL.—(*Provisional protection not allowed.*)—Weights in the form of governor balls are connected to a slide which presses on one end of a series of bell-crank levers, and causes another lever to slide or move a cylinder along a key way on a crank shaft which causes the ends of two levers to act against a diagonal rib on the cylinder and to effect a revolution of the cylinder and crank shaft. The opposite ends of these levers move a sliding block or spring connected by a rod to the shaft whence the balls receive motion. When the power of the engine is beginning to be spent the weight of the balls by falling and pressing the levers maintains the working powers.

[Printed, 4*d*. No Drawings.]

A.D. 1864, December 6.—N° 3044.

BOULTON, MATTHEW PIERS WATT.—(*Provisional protection only*).—These improvements consist in heating aeriform fluids by injecting some substance (metals or metallic oxides, chlorides, silicates, borates, &c.) in a state of fusion, cooling such fluids by currents of cold water; using a fan or blower instead of a plunger; utilizing the heated products of combustion to heat aeriform fluids; in using hydrogen or nitrogen to avoid oxydization; in a form of reaction wheel in which the liquid enters at the orifices in the circumference; in employing the vapour of ether or other volatile liquid to be evaporated by the exhaust steam or air to generate heat by driving liquid to and fro through tubes or interstices; in alternately contracting and relaxing pieces of vulcanized caoutchouc by heating and cooling agencies, and in the following mode of employing heated aeriform fluid.

The heated current is conducted through a tube and cooled by conduction from external liquids. A reduction of pressure is *thus caused* and air is forced into the tube "by the atmospheric "*pressure from* without. The mixed current thus set in motion

" forces its way through a contracted part of the tube into a " chamber beyond, creating pressure in that chamber. From this " chamber it is conducted to a cylinder in which it works a piston " in the ordinary way."

[Printed, 4d. No Drawings.]

A.D. 1864, December 15.—N° 3112.

PETTIT, STEPHEN.—(*Provisional protection only.*)—An iron vessel exhausted of air is put in connection with an engine similar to a steam engine which is worked by the atmospheric air entering through the induction passages. A rotating air exhausting pump or fan driven by the engine keeps up the exhaustion in the vacuum chamber, any little deficiency being supplied by hand air-pumps.

[Printed, 4d. No Drawings.]

A.D. 1864, December 17.—N° 3140.

TURNER, WILLIAM ALLEN, and COUGHIN, THOMAS TOWNSEND.—(*Provisional protection only.*)—Motive power is obtained from air compressed by a succession of pumps and receivers. The first pump receives air from the atmosphere and forces it into a receiver, whence it is conveyed to a second pump of smaller diameter than the first which forces it in a still more highly compressed condition in a second receiver, and so on. The pumps are worked from cranks, shafts, or excentrics worked by steam, water, or wind power, and provided with cog wheels and pinions. The toothed wheel actuating the third pump has a greater number of teeth than the second in order that it may turn at a slower rate to operate upon the densely compressed atmosphere, and the remaining pumps should be worked at proportionately slower speeds. To distribute the air a main pipe with a valve to regulate the pressure in it is laid down from the principle receivers. From the main junctions with the valves a stop-cock conveys the compressed air to engines in factories or otherwise through the intervention of a meter with a throttle valve to regulate the speed of the engine.

[Printed, 4d. No Drawings.]

A.D. 1864, December 19.—N° 3143.

BONNIER, EUGÈNE CONSTANT MARIE.—(*Provisional protection only.*)—Perpetual motion by atmospheric pressure. Two pumps

communicate with each other and with a pneumatic machine which produces a vacuum under the pistons which move in the pumps and exercise their efforts on the head of free trunks, terminating in small rollers and maintained in an oblique position by cushions. Through the trunks the pistons press on two bent levers turning on the same fixed axle and moving by their short arms and intermediate bars a balancing pole. The pole by straps and wheels moves a toothed wheel and a rack, which gives a to-and-fro motion to a chariot on four wheels. This chariot goes over the large arms of the bent levers, levelling successively each point to the level of the contact point with the rollers on the trunks. The machine is operated so that each piston alternately exercises pressure on its lever, while the other piston remains motionless, supported by the arm of a small lever. When the first piston is near the end of the stroke it meets a similar small lever, which raises it so as to remove its pressure from the large lever, and the small lever will be disengaged from under the other piston, which then presses on its large lever.

[Printed, 8*d*. Drawing.]

A.D. 1864, December 21.—N° 3171.

RAMSBOTTOM, John, and BLACKBURN, Thomas.—Improvements in engines intended to utilize the column and pressure of water but applicable to engines driven by fluids or vapours obtained from different sources. One or two cylinders are placed (if two, diagonally to each other) upon trunnions affixed to a plate of cast iron. The piston rods are attached to a crank; the motion of the pistons causes the cylinders to oscillate and the trunnions on which they move are constructed so as to form the valves of the engine, the fluid supplying them both enters and escapes from behind the plate to which they are affixed. When the cylinders are parallel the trunnion valve is made double and secured by the middle portion to the bed plate. Through this portion the fluid passes and distributes itself into two branches, each again divided by a mid feather extending through the entire valve. By the latter division the fluid returns and escapes through the middle portion. When the engine is required for reversing duty an additional valve worked by a hand lever is used, which changes the direction of the fluid.

[*Printed*, 1*s*. Drawing.]

A.D. 1864, December 31.—N° 3260.

SIEMENS, Charles William.—(*Partly a communication from Werner Siemens.*)—(*Provisional protection only.*)—" Paraffin or other liquid which expands greatly on being heated is placed in a vessel one end of which is heated and the other cooled. The liquid is driven by a piston from the hot to the cold end through a regenerator or cavity fitted with divided pieces of metal as described in No. 12,006, A.D. 1847. The liquid is very slightly elastic, but expands with a force only limited by the resisting force of the containing vessel. This force is used to drive a piston or plunger forward in a vessel. The working power may be obtained by increasing the diameter of the rod of the displacing cylinder. On the completion of the outward stroke of the plunger the pressure is released by means of a comparatively small changing cylinder in permanent communication with the vessel, and whose piston recedes when the effective stroke of the working plunger is almost completed. The engines No. 12,531, A.D. 1849, and No. 2074, A.D. 1860, may also be adapted to non-elastic fluids. A corrugated steel plate yielding a little to the internal pressure may in such cases be advantageously introduced into the cylinder cover or other part.

[Printed, 4*d*. No Drawings.]

1865.

A.D. 1865, January 11.—N° 82.

SPENCER, John Frederick.—Improvements in valves of steam, air, or gas engines. They consist of:—

First, two spring plates or clips connected at one end to a pin of a lever or wrist plate, secured to a weigh shaft having a reciprocating motion produced by an eccentric. The other ends of the clips have inside projections which clip hold of or gear into projections on a moveable block attached to the spindle of the admission valve. The admission valves are closed by a trigger or toe which by its attachment to a fixed point and the motion of the eccentrics and clips releases both the spring plates or clips. The admission port is suddenly closed by a spring.

Secondly, the introduction of two or more admission ports in each end of cylinders working with slide valves.

Thirdly, closing the valves by the pressure of steam, air, gas, or water on the piston of a small cylinder acting on the spindle of valves when worked by escapement gear.

Fourthly, closing the valves worked by such gear by the introduction of a spiral steel or india-rubber ring spring or springs acting directly on the back of a dash pot or piston used in a cylinder as an air spring.

Fifthly, forming one central chamber fixed midway to the cylinder framing arranged to contain the two air pistons and dash-pots and recoil springs, such chamber to be divided by a central diaphragm and to have moveable ends.

Finally, it is to be understood that in escapement valve gear to the cylinder of every engine are two admission valves, two pairs of clips, two dash pot pistons, and two sets of springs.

[Printed, 8*d*. Drawing.]

A.D. 1865, January 19.—N° 166. (* *)

HICKS, WILLIAM CLEVELAND.—This invention, relating to engines worked by steam, gas, or other fluid, consists in a novel arrangement of four single-acting cylinders, and in the construction of the pistons, which also act as valves for the distribution of the steam; and, although the ordinary valve gear and steam chests are dispensed with, all the principles of the operation of ordinary slide valve engines are retained. The four cylinders are rectangularly disposed on one plane to act upon a central crank. The pistons are cylindrical of the trunk order, recessed to receive the connecting rods which are jointed therein; the free ends of the rods abut against the crank pin. No couplings are used, the ends being kept in position by a ring as they oscillate with the sweep of the crank. An ordinary slide valve to start and stop the engine, is used to admit the steam into the several passages in communication with the cylinders, in the sides of which those to induct the steam are situated. The pistons are acted upon in succession in the direction of the crank, the steam being admitted to the cylinder about to commence its inward stroke, by the uncovering of its induction port at a certain part of the inward movement, by the preceding piston, when the steam passage in the piston about to be acted upon is coincident with the *induction* port. The exhaust from each cylinder is managed by a *similar* arrangement of the valve-acting pistons. The disposition

of the cylinder may be modified. The engine may also be used as a pump.

[Printed, 1*s*. 8*d*. Drawings.]

A.D. 1865, January 27.—N° 242. (* *)

MOORE, HANDEL.—(*Provisional protection not allowed.*)—" Im-" provements in applying power to the working of ships' wind-" lasses, winches, capstans, pumps, and other ships' gear."

This invention consists " in the application of power to ships' " windlasses, winches, capstans, pumps, and other gear on board " ships or other navigable vessels, by means of compressed air " and by turning the exhaust into the stoke-hole or other con-" venient situation below deck for the purpose of ventilation."

To apply the invention " a steam engine actuating an air-pump " placed in the hold or other convenient situation of the vessel is " used to compress the air into a suitable receptacle, from which " it is conveyed by means of pipes (by preference below deck) " by preference of copper, to stationary or oscillating cylinders " connected to the several apparatus, which cylinders are fitted " with suitable pistons, piston rods, and so forth, to impart the " required rotary or other motion to the several machines. The " exhaust pipes in all cases it is preferred to carry below deck " so as to enable the compressed air to be used for ventilating " purposes."

" In some cases it is preferred to form the stationary framework " of the several machines hollow, and to use the same as retainers " for the compressed air."

[Printed, 4*d*. No Drawings.]

A.D. 1865, February 6.—N° 331.

WATTS, JOHN ISAAC.—(*Provisional protection only.*)—Motive power is obtained by employing " two cylinders of equal length " and area, the one serving as the working cylinder the other as " an air compresser, each cylinder being provided with a piston " working air tight therein." There are two compressed air receivers. At starting, an air pump is necessary to charge the receivers, but the supply of compressed air is kept up by the compresser moved by the main shaft.

[Printed, 4*d*. No Drawings.]

A.D. 1865, February 18.—N° 468. (* *)

JONES, James Grafton. — This invention relates to the construction of beam engines, worked by steam, compressed air, water, or other fluid. Instead of "applying the piston rod " to and connecting it with one end of the beam in the usual " manner, the steam cylinder, whether of a single or double " acting engine, is mounted on and moves with the beam; and " the piston rod, when it is a single-acting engine, is con- " nected with a weight which is caused by the working of the " engine to be moved in a direction to and from the axis of the " beam; but when a double-acting engine is used, then the " piston rod is caused to pass through and work in a stuffing " box at each end of the cylinder, and to give motion to two " weights, one on each side of the axis of the beam. It is pre- " ferred that the steam engine should be mounted parallel with " the beam and above its axis, and that the beam beyond the axis " should be formed with a track suitable for receiving a weight, " and it is desirable that the weight or weights used should be of " a cylindrical form, and caused to roll or revolve when moved to " and fro on the track."

[Printed, 10*d*. Drawing.]

A.D. 1865, February 22.—N° 501.

BOULTON, Matthew Piers Watt.—Improvements in obtaining motive power from aeriform fluids and from liquids. Aeriform fluids may be heated by injecting in small jets fused metals, alloys, or metallic oxides, chlorides, fluorides, and salts The heated liquid may be made to flow over surfaces surrounded by the fluid or the fluid may be passed through it. The aeriform fluid may be nitrogen or carbonic oxide, in order to prevent oxidation of material. The products of combustion of the furnace used to keep the liquid fused may be employed to generate steam for motive power or to heat the air supplying the furnace by passing through passages or regenerators similar to those in Stirling's engine. Water may be injected on to the piston or valves, and be converted into steam. Petroleum may be distilled before combustion by making it pass in contact with the exterior of the combustion chamber. Heated aeriform fluid may be made to *issue into* a passage communicating with the air by which a larger

quantity of fluid of lower temperature and pressure is obtained, or instead of air the heated fluid may in its passage set a current of liquid in motion and act on vanes or any suitable instrument to produce motive power.

[Printed, 1*s*. Drawing.]

A.D. 1865, March 4.—N° 611.

BROOMAN, RICHARD ARCHIBALD.—(*A communication from Joseph Flandrin.*)—" Motive power from ammoniacal gas."

The machinery by which this is obtained consists of two generators placed in boilers and containing spiral tubes into which steam is admitted (the first boiler is heated by a furnace and the second by a flue) a receiver, four condensers, and six distributing boxes which are placed in a line and worked together by a distributing axle. To work the engine the air is exhausted and then water is placed in the first two condensers, water with some ammonia in the 3rd condenser and a strong solution of ammonia in the 1st generator. The hot exhaust gas coming from the working cylinder is re-dissolved in the 1st condenser causing the liquid to become heated, and at the same time a force and suction pump extracts the gas from the 3rd condenser and forces it into the 1st. After the water in the condenser has become saturated the pressure of the free gas forces up a small piston in the cover by means of which the distributing axle is turned round. This causes the exhaust gas to enter the 2nd condenser, opens a communication between the 1st condenser and the 2nd generator into which the hot saturated liquor passes, and also opens a communication between the 1st generator and the receiver, through which the spent liquid is forced by the pressure of gas. When all this liquid is decanted some gas also enters the receiver and forcing up a small piston again turns the distributing axle. By this second motion the communications between the generators and the first condenser and receiver are closed and a communication is made between the receiver and the 4th condenser into which the liquid from the receiver enters and where it cools, this being aided by the operation of the force and suction pump which draws off the gas and a little steam and forces them into the 2nd condenser. At the same time the fluid from the 2nd passes into the first generator.

[Printed, 1*s*. 8*d*. Drawings.]

A.D. 1865, March 8.—N° 651. (* *)

CLARK, WILLIAM.—(*A communication from Auguste Gerin.*)—(*Provisional protection only.*)—This invention relates to a rotatory engine, wherein is combined the rectilineal to-and-fro motion of sixteen single-acting pistons, which work in cylinders, circumposed at an acute angle to the radius, round a disc, which revolves on a central axis. The rods of these pistons act diametrically in pairs, by means of connecting rods, the ends of which are jointed to the ends of the piston rods, so that the outward strokes of the pistons, as they each in sncceasion arrive at one point in the revolution, lift the pistons to which on the opposide side of the axis they are respectively coupled, ready for the outward stroke, when, on arriving at the point of action, the induction steam passage corresponds with the passage of supply, which is directly over the axis. The pistons are then in succession driven from the centre of rotation to the end of the stroke, whilst the pistons to which they are coupled, are simultaneously raised to the centre, so that as the disc rotates, all the descending pistons on one side the vertical plane of the axis, are at the greatest distance therefrom, whilst all the pistons on the other side are drawn towards it, and it is this difference in the leverage or weight of the pistons, with regard to the central fulcrum or axis, which causes the disc to rotate.

[Printed, 6*d*. Drawing.]

A.D. 1865, March 15.—N° 731.

SMITH, HUGH.—(*Provisional protection only.*)—This is for firing the mixed charges of air and gas engines by vapour which burns spontaneously on coming in contact with air. When the cylinder is charged with gas and air, some gas is introduced which has passed over bottles containing liquid phosphide of hydrogen and carries with it the vapour of the phosphide which on meeting with air ignites, and an explosion at once takes place.

[Printed, 4*d*. No Drawings.]

A.D. 1865, March 23.—N° 818.

VON RATHEN, ANTHONY BERNHARD Baron.—Compressed air engine consisting in a power wheel, which turns in one direction and is driven by compressed air contained in two closed

chambers within the wheel. The chambers are closed by divisions of the surrounding cylinder, and are triangular in form, one of the sides of one triangle being parallel to one side of the other triangle, and these sides are placed at the opposite ends of a diameter. The pressures on the parallel sides are counterbalanced either by a hollow piston in the form of a parallelogram or by closing the parallel sides by triangles turning on shafts or axles placed at one angle, or by cutting a cavity through the whole length of the wheel on both sides towards a centre piece sliding down closed parallels from both sides, such cavity containing a sliding metal box or oblong parallelogram. Two other sides of the triangles are in the same diameter of the wheel, and the third sides are formed by the periphery. The compressed air acts on the sides in the same diameter, upwards in one chamber, and downwards in the other, and the re-acting force being counterbalanced, the wheel must move with a force nearly equal to the united expansive force in the two chambers. A second wheel turning in the opposite direction must be provided where reverse motion is wanted. The engine is also provided with air compressing apparatus, a reservoir for compressed air, a regulator, feed box, and box for transferring the air from one wheel to the other.

[Printed, 7*s*. 2*d*. Drawings.]

A.D. 1865, March 23.—N° 827. (* *)

BOULTON, MATTHEW PIERS WATT.—This invention, which relates to "obtaining motive power from aeriform fluids and from "liquids" has for its object the utilization of heat evolved by combustion, for producing motive power through a greater than the ordinary range of temperature and pressure, in order that a larger proportion of the heat may be converted into mechanical effect.

Valves used for regulating the passage of highly heated aeriform fluids, work in valve chambers containing liquid, the level of which when caused to rise closes the fluid way, and which orifice is opened when the level of the liquid falls. This effect is produced by means of a plunger which is actuated by the engine. Two valves may be employed, one exposed to the greatest heat partially closing, and the other protected by the first entirely closing the passage. The valve may be constructed with internal

passages, through which a current of cold water may be caused to flow for the purpose of keeping the valve cool.

When products of combustion are employed to work a piston, the induction valves shut off the supplies of inflammable fluid and air previous to their combination, ignition being caused either by a flame burning in the passage or orifice, or by means of an electric spark.

Artificial streams or falls of water or liquid, set in motion by jets of high-pressure aeriform fluid, are employed to produce motive power. Two vessels of unequal height are united by a passage for the free interflow of liquid. Aeriform fluid under pressure is blown into the liquid in the highest vessel, which is thereby caused to overflow, the liquid falling into the lower vessel, and this constant fall is availed of for giving motion to a wheel, turbine, or engine.

Artificial streams may be set in motion by the impulsive force of jets of high-pressure aeriform fluid, and caused to act upon vanes attached to rods which work to-and-fro, and impart reciprocating motion to machinery.

[Printed, 10*d*. Drawing.]

A.D. 1865, March 31.—N° 905.

PINCHBECK, John.—(*Provisional protection only*.)—This is for connecting the exhaust pipe of the cylinder of engines worked by the explosion of air and gas with a condensing chamber in which either jet or surface condensers may be used.

[Printed, 4*d*. No Drawings.]

A.D. 1865, April 1.—N° 930.

HAENLEIN, Paul.—(*Provisional protection only*.)—" Navigable " balloons " are made of a " paraboloid, elypsoid, hyperboloid," or some similar form, and are furnished with one or more rudders or steering vanes and propelled by a screw or paddles worked by a gas engine of cast steel, which is worked by coal gas or hydrogen derived from the balloon itself, whose place is supplied by forcing in atmospheric air while the difference of weight is equalized by discharging ballast.

[Printed, 6*d*. Drawing.]

A.D. 1865, April 4.—N° 949.

BROOKES, William.—(*A communication from Joseph Perrigault, Marie Joseph Denis Farcot, Jean Joseph Leon Farcot, Michel Basile Abel Farcot, Joseph Etienne Eloi Château, and Emmanuel Denis Farcot.*)—Motive power is obtained from the action of steam, gas, or other fluids, on revolving wheels.

"In order to produce intermittent impulses the floats or vanes "of the wheel are of form variable enclosed between two parts "of the same fixed case. The fluid being introduced with a "certain velocity comes in contact with one of the floats of the "wheel giving to it a part of its velocity and then escapes by a "lateral orifice which conducts it upon another float to which it "likewise gives a part of its velocity. The fluid thus acts suc-"cessively upon the different floats or vanes of the wheel losing "each time a fraction of its velocity approximating to that of the "wheel and it will at the end of the motion have given off its "power almost entirely without requiring great velocity of rota-"tion as in wheels as ordinarily arranged."

For continuous impulses it is sufficient to prolong sufficiently one of the floats, which may be done by giving the wheel the form of a spiral or involute of a circle. Several arrangements of the floats and conduits are described. In most the conduits are coiled in such a way as to return the conducting orifices in the same direction as the primitive orifice. The blades or vanes may be straight or curved and perpendicular or otherwise to the plane of rotation, and in some arrangements are inclined in helices. The conduits or jets of injection and rejection are in some cases constituted spontaneously by the effect of the form of the case and of the vanes.

[Printed, 1*s.* 10*d.* Drawings.]

A.D. 1865, April 6.—N° 986.

HUGON, Pierre.—This invention consists in effecting the combustion or explosion of gas in a gas engine by means of slide or other valves carrying gas burners supplied with gas under pressure.

The working cylinder has three valves. The first being the inlet and outlet valve, and also carrying two burners. The second regulates the injection of the motive gaseous compound and of a shower of water, and the third admits water for the purpose

of cooling the cylinder. As the piston descends it draws the explosive compound into the cylinder and when it has arrived at say two-fifths of its stroke, the first of the three valves descends, shuts the inlet passage, and brings one of the burners in contact with the explosive compound. The burner is extinguished by the explosion, but is immediately relighted by an external burner. The three valves may be replaced by other valves whose construction is described, one being a rotatory valve carrying a burner and serving the purpose of the three valves before described.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1865, April 17.—N° 1074.

DE ST. CÈRAN, Louis.—" Gas-ammoniacal engines."

Water saturated with ammonia is heated in a boiler and the gas passes off by a worm, in a pipe through which cold air is driven, and by a second worm, immersed in a vessel of cold water, and thence by a two-way cock into one of two receivers in which the pressure being the same as in the boiler it liquefies. The cock is then closed and the pressure being reduced the liquid evaporates and passes through a worm immersed in a current of warm water to the working cylinder. The cold produced by such evaporation helps to liquefy the gas in the other receiver. From the cylinder the gas passes to the condenser where it is absorbed by very cold water, and a vacuum is produced on one side of the piston. The water from the condenser is pumped through a pipe into the boiler. In this pump is a worm by which the impoverished water from the boiler passes out, giving up its heat in part to the water entering the boiler. From this worm the impoverished water is forced into the pipe containing the worm which leads the gas from the receiver to the cylinder, and thence into water spaces surrounding the receivers where it nearly freezes from the cold produced by the evaporation of the ammonia. It afterwards passes to the condenser.

[Printed, 8*d*. Drawing.]

A.D. 1865, April 25.—N° 1156.

JACQUELIN, Claude, junior.—(*Provisional protection only.*) —Two principal wheels turn in the same direction on the same axle, one being immersed in a tank and composed of moveable teeth which by the aid of counterweights rise or fall as they

approach or recede from the centre of gravity of the wheel, being lifted on the side where they receive balloons filled with compressed air, and laid down in a contrary direction on the other side. The second wheel receives the balloons at its upper part through a channel, and descends them to its lower part in a funnel which replaces them in each cylinder of a table, charged in its circular motion to reintroduce them under the tank. The table is formed of ledges which lower themselves level with a fixed piece and form with it a groove closed by the tail piece of the tank. The ledges pass under this piece to form cavities, each of which receives a balloon and passes under the tail of the tank to the water where the balloon leaves it. The water is kept at the same level by a feeding basin into which the water which is lost by the passing out of the balloons is pumped.

[Printed, 4*d*. No Drawings.]

A.D. 1865, May 10.—N° 1301.

RICE, WILLIAM JOSEPH.—In this invention there are two or more chambers in which work pistons connected to the ends of a beam. The piston is provided with valves. Below it is a vibrating diaphragm mounted on a rocking shaft and provided with a sector piece. The shaft carries another diaphragm working in a chamber connected with a reservoir filled with compressed air. The engine is started by compressed air from this reservoir being supplied to a small auxiliary engine and at the same time compressed air is supplied above the piston which is forced down. The diaphragm is thus forced down, the air beneath it is compressed and forced in the compartment behind the diaphragm in the chamber communicating with the reservoir, and the air on the other side of this diaphragm will be forced into the reservoir. During the descent of the last diaphragm the compartment above it is filled with air from the atmosphere through a valve. The valves in the piston are opened by its descent and the compressed air thus passing below it will assist in its rise. In this way the engine compresses its own air.

[Printed, 10*d*. Drawing.]

A.D. 1865, May 29.—N° 1468. (* *)

MOSELEY, HENRY.—This invention relates to engines of the rotating class, for obtaining motive power, and for other purposes.

It consists of two cylinders, one concentric within the other, and of such smaller diameter, that an annular space is formed between the two, the smaller cylinder exactly fitting lengthwise to the interior between the ends of the larger. Along the periphery of the small cylinder there is a projecting steam resistant ridge, which extends so far across the annular space, that a packing strip placed in a groove formed along the edge of the ridge, is brought into contact with the internal surface of the large cylinder, thereby longitudinally dividing the annular space. The axis on which the cylinders are mounted is tubular from each end to the centre, where the communication is stopped by the interposition of a diaphragm. Diametrally opposite each other, are two radially sliding piston plates, which fit into deep grooves or recesses formed in the larger cylinder. The grooves are longitudinally disposed on opposite sides of the axis, and diverge beyond the inner circumferential surface, to a depth through the metal, more than equal to the breadth of the annular space, across which when the piston plates are convergently projected, so as to touch the inner cylinder, a portion of each plate will remain in its respective groove, alternately diverging in order that the resistant ridge on the inner cylinder may not come in contact. The axis and inner cylinder are fixed, whilst the outer cylinder revolves and gives off motion and power. The piston slides are moved in and out of the grooved recesses by means of rollers, which traverse excentric paths formed in cams fixed on the axis. The steam or other fluid acts in one direction against the resistant ridge, and in the other against the piston slides, and thus causes the rotation of the outer cylinder, as the slides alternately come round and are projected across the annular space. The frictional parts are suitable packed. Modifications are described.

[Printed, 3*s*. 2*d*. Drawings.]

A.D. 1865, June 8.—N° 1563.

TUCKER, Samuel Blatchford. — (*A communication from Cyrus W. Baldwin, and Walter Davis Richards.*)—"Improve-" ments in caloric or heated air engines."

The first set of improvements consists in isolating the furnace from the rest of the engines; arranging the axis of the air engine in a vertical plane through the centre of the main shaft to serve as a support for its bearings and so as to be worked directly from the

main crank; arranging and guiding a flexible disk valve; making the exhaust valve seat so that it can be removed for inspection without removing the valve chest, and in a construction of the exhaust valve; placing a secondary fire-box between the main box and the valve chamber, and furnishing it with a flame from a gas jet or oil to ignite the unconsumed gases; preventing the communication of heat from the lower hot portion of the engine cylinder to the upper portion by circulation water pipes, and arranging the air passages of the furnace so as to pass in air at higher or lower points.

The second set consists in providing two or more fire-boxes for the supply of a single cylinder; cutting off the flame and intercepting the ashes by a tortuous passage leading to the valves; supplying the whole of the air above the fuel; providing the top of the furnace with a cavity supplied with water to utilize the heat escaping; encasing the valves and passages leading to them in a cavity through which cold air passes to the furnace; placing the entrance port so as to discharge directly under the centre of the piston; forming the lower part of the cylinder of fire-brick or other non-conductor; and, lastly, in the construction of an improved leather packing.

[Printed, 2*s*. 2*d*. Drawings.]

A.D. 1865, June 20.—N° 1656.

CLARK, William.—(*A communication from Jules Gros.*)—Gases for the production of motive powers are generated from fulminating substances placed in caps in channels contained in a chamber, and struck by hammers at the desired times. The gas thus produced drives out the air from the chamber into a larger chamber or reservoir, which communicates with the first by a valve. From this chamber the air and compressed gases are conducted to the apparatus intended to transform their pressure into available power.

[Printed, 8*d*. Drawings.]

A.D. 1865, July 11.—N° 1832.

DUFRÉNÉ, Hector Auguste.—(*A communication from Charles Tellier.*)—(*Provisional protection only.*)—Liquid ammoniacal gas is enclosed in any suitable place, and at the same time about five times a greater quantity of water is used. The whole of the gas

is evaporated, and becomes fit for a motive power at a pressure of about ten atmospheres. The effect is regular, "the caloric neces-" sary for the gasification of the ammonia is furnished constantly "by the caloric of condensation (and in combination) disengaged "in the aqueous solution." The solution formed by the ammonia is collected, and regenerated for the recovery of the ammonia it contains, which is again liquified and used as before.

[Printed, 4*d*. No Drawings.]

A.D. 1865, July 19.—N° 1874.

LÜDEKE, Johann Ernst Friedrich.—Motive power, by capillary attraction, may be obtained in various ways, some of which are given by way of illustration. In one a case in the shape of a double blow-bellows has one side which works on a pivot, causing one side to be open or expanded, and the other close or contracted. A series of plates or sheets of perforated iron, india-rubber, gutta percha, wire work, or other substance, between which is fixed sponge, cotton, or other absorbing material is placed perpendicularly within the case, which is then filled with quicksilver, water, or another liquid. The moveable side is made by some mechanical contrivance to close one end, by which the fluid is made to flow to the other side, which will take that end of the case in the shape of a blow-bellows down. This end is then closed, and the other end opened, by which means the water or liquid goes by attraction to the opposite side, and an alternate up and down movement is produced. In another method a series of wheels revolving on a common axis are placed in a tank filled to about a third in liquid, which rises on one side of the wheels by capillary attraction, but is prevented from doing so on the other by projections fixed to the tank. An overweight on one side is thus produced, which causes revolution of the wheels. The same result is produced by two wheels nearly touching at one side, but further off on the other. The space between the wheels is filled with sponge, felt, or similar substances. The over weight is caused by the fluid being squeezed down at one end than the other. Two bars or rods increased in size towards the ends, and acting on a pivot in an up and down motion may also be used, the ends being fitted with sponge or other material.

[Printed, 8*d*. Drawing.]

A.D. 1865, July 22.—N° 1910.

PERRÉ, EDMUND. — (*Provisional protection only.*)—Two fixed cylinders are each divided into two parts by a central valve. The upper parts are filled with water, and the lower ones fitted with internal telescopic cylinders sliding within them, and having air chambers which expand or collapse. These air chambers communicate with external chambers by tubes passing through the bottoms of the internal cylinders. The external chambers have moveable taps connected by rods to a crank shaft. One of the valves being opened, the water will descend, and force the air from the internal cylinder into the external chamber. The second internal cylinder is then raised by a balance lever or levers, and an alternating motion is thus obtained, which gives a continuous rotation to the crank shaft.

[Printed, 4*d*. No Drawings.]

A.D. 1865, July 22.—N° 1915.

BOULTON, MATTHEW PIERS WATT.—Improvements in obtaining motive power when heated air is employed.

These are making the rods of the valves to pass through chambers cooled by water; cooling the heated aeriform fluid by injecting water; a mode of injecting heated fluid into a vessel containing aeriform fluid under pressure by opening two or more valves, so that the heated fluid flows in through the lowest; heating air by attaching to the lower end of the plunger a perforated vessel, which is made to dip into fused metal, salt, or other body; igniting a mixture of air and inflammable gas at a high pressure after the piston has moved a certain space, so that no hot gas passes through the induction valve, and protecting the eduction valve by interposing fluid during the performance of the work; obviating the shock to the machinery from the explosion by using two pistons with a cushion of air between them, which air may be compressed by the shock, and forced into a vessel, whence it can be supplied to mix with the inflammable gas or to work machinery; and producing motive power otherwise than by working a piston. This is done by making heated aeriform fluid issue in a constant stream into a passage communicating with the air by one or more openings. Air is drawn or sucked into this passage, and the mixed fluid passes into a chamber,

where it creates pressure, and may be used to perform work. The fluid may also be injected by being made to pass through a gradually expanding passage as in Gifford's injector, No. 1665, A.D. 1858. Various modes of utilizing the waste heats either in a thermo-electric pile or to generate vapour or otherwise are also described. Some of these improvements are described only in the provisional specification.

[Printed, 1s. Drawing.]

A.D. 1865, July 28.—Nº 1958. (* *)

NEWTON, William Edward.—(*A communication from Henry Isham.*)—This invention relates to a water meter, which may be employed as a water, gas, or steam engine.

It " consists of a group of any number of cylinders (four by " preference), each provided with a piston, and arranged round " a central axis of rotation. These cylinders are open at their " lower ends, and in their revolution round their axes they pass " in succession over an induction way to receive the water or " other fluid which actuates and raises the pistons in the cylin- " ders. The cylinders then pass over an eduction way, through " which the water or other fluid is discharged, and the pistons " descend. The pistons are connected by rods with a plate " mounted on a hub or with the arms of a hub which turns " on an axis placed at an angle with the axis of the group " of cylinders."

" When water or other fluid under pressure passes from the " induction pipe into any one of the cylinders it acts against and " forces the piston of that cylinder upwards, and this action, by " reason of the inclination of the axis of the plate, causes the " cluster of cylinders, with their appendages, to rotate about " their common axis, and that cylinder which is on the opposite " side of the axis is thereby caused to pass over the eduction " way, into which the water or other fluid is discharged by the " downward motion of its piston. Before the eduction pipe is " opened, the water or other fluid discharged into the eduction " way escapes through the outer portion of the eduction aperture " or port into and fills the case, making a counter pressure on " the upper surface of the piston, thereby producing an equili- " brium, and holding the meter or engine in a state of rest; but " the moment the eduction way or pipe is opened for the escape

" of water or other fluid the equilibrium is destroyed, and the " meter or engine started and worked in exact proportion to the " capacity of the discharge, the surplus pressure being balanced " by the fluid in the surrounding case. The surrounding case " should be provided with a small cock or valve to permit the " escape of air until it is filled with water or other actuating " fluid."

"When employed as a meter for measuring the flow of water or " other fluids, the hub of the plate should be connected with " suitable registering mechanism, but when used as a motor the " hub is to be provided with a belt, wheel, or other gearing for " transmitting motion."

[Printed, 10*d*. Drawing.]

A.D. 1865, July 31.—N° 1973.

STOLL, John James.—(*Provisional protection only.*)—Motive power is obtained from two similar wheels on the same axis. Each is provided with a number, say twenty-four, levers or spikes on which smaller wheels run as a train on a railway. The sides of the large wheels are divided into zones, each having a fresh division of small wheels, and all the wheels on the same lever are connected by bars or chains. A weight is attached to each of the axes of the last or external division of small wheels. If a new small wheel be attached to each end of the pivot of the inner division nearest to the axis of the large wheels, and made to run over a bar forming an inclined plane, it will be found that (the sets of small wheels having ascended and been fixed by a spring or suitable contrivance and maintained so till relieved on their descent) the weight on the extended or loaded or descending levers is about double that necessary for the continued ascent. The inclined plane bar is placed by the side of each of the large wheels, and the additional external wheels run on it, the levers of the large wheels pressing on the small wheel produce the ascent. Instead of additional wheels the pivots of the small inner section may be made to run on the inclined plane.

[Printed, 6*d*. No Drawings.]

A.D. 1865, August 1.—N° 1992.

BOULTON, Matthew Piers Watt.—In gas engines "in " order to utilize a larger portion of the heat the following method

" may be adopted :—The mixture of air and inflammable fluid " having been admitted into the cylinder designed for its reception " and ignited, the products of combustion are caused to traverse " a narrow passage or narrow passages in which a wetted surface " is exposed to their action. Heating the water on this surface " they generate steam, and the steam thus produced co-operates " with them in driving the piston of the engine."

A portion of the heat employed to produce motive power may be applied to produce electro-motive force by means of a thermo-electric pile. In order to prevent oxidation, the metals employed are heated by means of freed metallic oxides, chlorides, sulphides, or salts or earthy materials. Steam or aeriform fluid may be superheated in tubes immersed in some liquid through which flame or gaseous products of combustion are passed. To equalize the action of an engine worked by aeriform fluids, a shaft is made to revolve twice as fast as the crank shaft, and to compress air by a piston in a cylinder. It will thus resist the first part of the stroke of the working piston and aid the last part. A mode of using two pistons, of which one serves to drive out the products of combustion, is also described in the provisional specification.

[Printed, 10*d*. Drawing.]

A.D. 1865, August 4.—N° 2021. (* *)

CLARK, WILLIAM.—(*A communication from Francis Bernard de Keravenan.*)—Apparatus applicable as a motive-power engine, to be worked by steam or otherwise; also applicable as a pump, or a fluid meter.

It consists of an outer fixed cylindrical case closed at each end by covers, through the centre of which is passed a central shaft or axis. Mounted upon the shaft, within the cylinder, there is a closed piston drum. This drum is eccentrically fixed upon the shaft, so that when revolving, its major radius is always in frictional contact with the internal surface of the outer cylindrical case, between which and the eccentric piston drum, there is a crescent formed space constantly moving round the central axis. Formed in a diametral line with each other, at opposite sides of the case, there are two deep recesses, wherein are fitted two slides, which work radially to and forth across the internal space, their *inner* ends being kept in constant sliding contact with the surface *of the eccentric* piston drum, by means of external side rods, and

cross heads fitted upon rods attached to the outer ends of the slides. One of the slides acts as the steam valve, and admits the steam into the crescent formed space through a passage at one side, the exhaust passage opening out of the space, through the case on the other side or back of the valve slide, which also constantly acts as a steam resistant, whilst the force of the steam pressure in the opposite direction, compels the rotation of the eccentric drum and shaft. The opposite slide is narrow and does not divide the space, but when forced outward by the eccentricity of the drum, by means of the outside connecting rods, it effects the return or inward movement of the steam slide, which in turn is forced outwards by the surface of the drum, and effects the return movement of the opposite slide. A self-adjusting packing piece is hinged to the inner end of each slide, working in constant sliding contact with the periphery of the eccentric drum.

[Printed, 1*s.* 10*d.* Drawings.]

A.D. 1865, August 7.—N° 2051.

BOULTON, Matthew Piers Watt.—Generating and heating steam and æriform fluids. The invention consists in making rods, plates, or pieces work through apertures in the sides or bottom of the vessel containing the fluid, and enter heated liquid which may consist of matter, earthy, saline, or metallic in a state of fusion. From this they derive heat which they impart when drawn back to the steam or aeriform fluid.

[Printed, 6*d.* Drawing.]

A.D. 1865, October 9.—N° 2600.

GEDGE, William Edward.—(*A communication from Abraham Désiré Cherfils.*)—This is composed of two or three similar cylinders, in each of which moves a full piston having an optional measured stroke. Beneath the lower limit of the stroke is a vacant space to act as a sucking and force pump in order to cool the sides of the cylinder. The rods of the pistons are attached to cranks inclined at 120° to each other. At the upper surface of the cylinder is a combustion chamber having three openings, one for air, one (which is only a fifth the size of the first) for gas, and one for the escape of the products of the combustion. The mixture is ignited by means of two of Bunsen's elements with a strong Rhumkorff bobbin. An electric current is established or discon-

tinued by copper wires carried by small vectors on each eccentric of the cylinder. The mixture used may be bicarburetted hydrogen gas, ether, alcohol, petroleum, tar, or other matter, sometimes combined with water or steam. An apparatus for procuring bicarburetted hydrogen gas on board ship is described.

[Printed, 8*d*. Drawing.]

A.D. 1865, October 17.—N° 2675.

BROOMAN, Richard Archibald.—(*A communication from Guillaume Reinlein.*)—(*Provisional protection only.*)—Improvements in caloric engines.

These are, 1st, setting the engine so as to have the axis of the moter cylinder vertical, thus getting rid of the friction of the pistons.

2ndly, substituting for the furnace a tubular boiler consisting of three horizontal iron plates united two and two by tubes, and the whole surrounded by an iron cylinder. The flame passes inside the lower tubes connecting the two lower plates and outside the upper tubes, and then descends other pipes, and is made to surround the cylinder before escaping into the chimney.

3rdly, applying gas and mineral oils by setting the gas or liquid inflamed under each of the tubes between the central and top plates.

[Printed, 4*d*. No Drawings.]

A.D. 1865, November 24.—N° 3016.

WAUTHIER, Jules.—(*Provisional protection only.*)—A steel tube, about five feet in length, is closed at one end, has a tap near the other, and is connected by a bent tube to a cylinder. The tube, called the reservoir, is filled with mercury from which the air and moisture have been expelled by heat, and is then placed with its closed end upwards so as to form a vacuum at such end. An air-tight piston is placed in the cylinder. The reservoir and cylinder are moved to an inclined position of about 45°, whereby the mercury will rise in the reservoir and the piston will fall. By balancing the reservoir and cylinder on proper supports so that they may be easily moved by an excentric from a vertical to an inclined position, a continuous up-and-down motion may be given to the piston which is transmitted to a crank shaft.

[Printed, 4*d*. No Drawings.]

A.D. 1865, November 28.—N° 3046.

ROBERTS, Robert Martin.—(*Provisional protection only.*)—Motive power is derived from gravitation by attaching a sliding bar, weighted at the extremities, to a diameter of a disc or wheel in such a way as to slide from or towards the centre in a line with the diameter. Friction rollers on the bar work on a cam or inclined plane by which the bar is raised so that its centre of gravity is above that of the wheel, and the upper part of the wheel descends. The opposite end of the bar then acts in the same manner, and makes the wheel complete its revolution. Several wheels should be connected in order to maintain the motion.

[Printed, *6d.* Drawing.]

A.D. 1865, December 16.—N° 3260. (* *)

READE, Cecil Loftus Wellesley.—(*Provisional protection only.*) — " This invention relates to certain improvements in " obtaining motive power by magnetism or gravitation, or both " combined, applicable to various useful purposes, including mag- " netic or electric clocks. I propose to construct an iron wheel " with radial spokes and central box or hub, which is to be set on a " shaft supported by standards or bearings ; on the circumference " or outer periphery of this wheel I apply eight or more tangential " hammers or armatures ; they are attached by hinges and are in " the forms of arcs to correspond with the periphery of the wheel. " Thus, in whatever position the wheel is placed, it will follow " that all the armatures above the level of a horizontal line drawn " through the diameter of the wheel will be closed or concentric " with the circumference, while the others will be open or in an " outward or extended position, thus creating a leverage and " causing the wheel to be out of equilibrium, that side of the " wheel on which the hammers or armatures are extended will be " borne down, thus bringing over the successive armatures, and " creating a continuous rotary motion, while the ascending arma- " tures will fall against the opposite side of the wheel, and not " exercise any counteracting leverage to the descending series. " The foregoing is an example of the power of gravitation, but " where I desire to aid the motion by electricity or magnetism, I " propose to apply a series of electro-magnets around and outside " the wheel and armatures, whereby the armatures will succes- " sively be attracted during the revolution of the wheel, and " thus create a continuous motive power. By an application

" of clockwork movement the speed of the wheel may be easily
" regulated."

[Printed, 4*d*. No Drawings.]

A.D. 1865, December 19.—N° 3272. (* *)

CARR, John Wright.—This invention relates to producing rotary motion by an apparatus actuated by steam or compressed air, gas, water, or other fluid. Concentrically within a fixed cylindrical outer case, is mounted upon a central hollow shaft or axis, an inner or piston cylinder, which is so much less in diameter than the interior of the case, that an annular space is formed between them, the length of the piston cylinder corresponding with the interior length of the case. The piston, which also corresponds in length with the cylinder and case, is fixed across the periphery of the cylinder, so as to divide the annular space, and when the cylinder and shaft revolve, come into steam-tight frictional contact with the internal surface of the case. Two steam stops or slides, in length somewhat longer than the inner cylinder, are fitted into recesses diametrally formed, in opposite sides of the case. These slides, by means of cams or otherwise, are respectively in succession, as the piston is carried round the annular space, suddenly withdrawn into the recesses to allow it to pass, and then again projected across the space the moment afterwards. There are two ports or passages, one on each side of the piston, which answer respectively, according to the direction of motion, either for the induction of the steam, which comes through the hollow axis, or for the exhaust, which is carried off the same way through a separate passage, when lateral apertures in the shaft are, as it revolves, brought into coincidence with the steam and exhaust passages. The steam pressure abuts alternately against the slides in one direction, and against the piston which yields to it in the other direction, whereby rotation of the shaft, whence the power is given off, is obtained. Stuffing boxes and suitable packings are provided.

[Printed, 10*d*. Drawings.]

A.D. 1865, December 20.—N° 3295.

HANCOCK, Frederick Lamb, and HANCOCK, Charles Lamb.—Improvements in propellers for ships, parts of which *are applicable* to windmill sails.

They consist in fitting on a shaft or a boss thereon at about the same point, and at an angle of about 45° with the shaft, two or more semicircular or nearly semicircular plates, which may be made to cross each other or extend partly at each side of the boss or shaft, or not. The plates may also be made in the form of a quarter of an ellipse, and may be plain or formed with flanges on the curved edges of their acting faces. The flanges are, at their middle, of a breadth about equal to the radius of the plates, and gradually diminish towards their ends, where they meet the straight edges of the plates.

[Printed, 8*d*. Drawing.]

A.D. 1865, December 28.—N° 3358.

BROOMAN, RICHARD ARCHIBALD.—(*A communication from Jean Fiot.*)—This consists in an apparatus to be fitted to steam engines for the purpose of substituting the action of ammonia for that of steam. The boiler of the engine is filled to about half its height with an ammoniacal solution. The gas, and a little steam, after acting in the cylinders, enter an expansion chamber, and then passes into a condenser, where the gas is cooled and the steam condensed. The gas then passes into the dissolver, in which it is dissolved by water. After the water has become saturated, the gas lodges at the upper part, and causes the water to rise through a tube into the feeder, and when it has risen to a certain height marked by gauges outside, the feed is performed, and the saturated water introduced into the boiler; an equal portion of the lower liquid in the boiler is at the same time withdrawn, and passing through a serpentine coil of pipes traversed in opposite directions by the two currents, the water from the boiler gives up most of its heat to the feed water. The former is afterwards cooled in the extractor, and passes into the dissolver. The feed may be made continuous instead of intermittent by regulating the feed and exit cocks. The condenser and dissolver are kept cool by a stream of cold water, and the feeder is furnished with a valve for the escape of air.

[Printed, 8*d*. Drawing.]

1866.

A.D. 1866, January 4.—N° 27.

MACNEILL, THOMAS TELFORD.—(*Provisional protection only.*) —Motive power is produced by means of a strong enclosed receptacle containing incandescent fuel, into which is forced the requisite air for maintaining combustion. The products of combustion pass in jets into a second receptacle, where they are brought into intimate contact with jets of water or steam and water. The water is converted into steam by the heat and the compound used for generating force. In some cases the steam or water may be introduced into the cylinder, or may be altogether dispensed with, in which cases the mixing chamber may be dispensed with.

[Printed, 4*d*. No Drawings.]

A.D. 1866, January 9.—N° 62.

PERRÉ, EDMUND. — (*Provisional protection only.*) — Motive power is obtained by alternately inflating and compressing air bags or chambers secured on the arms of a revolving wheel, the moveable or top part of each chamber being supplied with weights, which, when the bags ascend, inflate them, but in descending rest on and compress the bags and drive the air through tubes communicating with a common thoroughfare into a second arrangement of air chambers, one end of which being fixed and the other moveable, give motion as the pressure of air is forced into them to a crank or other equivalent. The air is received and discharged through perforations in the axis of the wheel, half the holes being exposed to receive the air, and the other half being covered by a receiver through which the air is expelled.

[Printed, 4*d*. No Drawings.]

A.D. 1866, January 19.—N° 181.

CLARK, WILLIAM.—(*A communication from Alexandre Bobrownicki.*)—(*Provisional protection only.*)—Motive power.

The cylinder in this invention consists of two parts, the diameter of that part next the piston rod being greater than the diameter of the other part. The piston is also formed of two

parts, and adjusted to fit the cylinder, so that during part of the stroke, an empty space or vacuum is left between the piston and cylinder which aids the return of the piston. Steam is introduced into a space between the casing and the small end of the cylinder, and thence into the cylinder, and by an aperture which may be closed by a packing ring into the piston, and after traversing several passages in it passes out either by openings or by an annular channel in the lateral face of the piston into a space around the cylinder in which the steam is kept at a proper uniform pressure, and whence it passes either to a condenser or into the boiler. Heated air or gas may be used in the place of steam.

[Printed, 8*d*. Drawing.]

A.D. 1866, January 27.—Nº 267.

MENNONS, MARC ANTOINE FRANÇOIS.—(*A communication from Nicolas de Telescheff.*)—Compressing air for the generation of motive power. The apparatus is attached to and communicates with a reservoir by means of two tubular columns furnished with stop-cocks. At starting, a certain amount of pressure is produced in the reservoir either by heat or by a force pump, and then the stop-cocks being opened, the air passes up one tubular column into a cylindrical chamber divided into two compartments by a partition with a conical outlet. In passing through these chambers, the air acquires greater velocity, while its temperature and pressure are diminished, and in consequence the outer air, together with the heated gaseous products of combustion from a furnace, enter the chamber. The mixture passes into the second compartment, and the current of hot air again expands, its velocity is increased, and its temperature reduced. Another portion of outer air enters the compartment, and passes with the jet into a conical pipe, in which the velocity is reduced, and the temperature and pressure increased until they are sufficient to overcome the pressure in the reservoir into which the mixture passes through a valve.

[Printed, 1*s*. 8*d*. Drawings.]

A.D. 1866, January 30.—Nº 291.

TONGUE, JOHN GARRETT.—(*A communication from Edouard Patan.*) — (*Provisional protection only.*) — "Obtaining motive "power, either giving or not giving light."

Air is taken as cold as possible, and compressed into a close space divided by thin metal plates. To obtain light the air is conducted through tubes, inside which are gas pipes, and which terminate in glass cylinders. To these cylinders other tubes of the same diameter are fitted with a moveable collar. The air heated by the combustion of the gas is conducted to the cylinders. When light is not required, the air first passes into a casing round the furnace, and thence into the upper part of a heating box traversed by a multitude of small smoke tubes. The air leaves the box at its lowest part, and after acting on the pistons, is used to supply the furnace, and finally passes off by the smoke tubes. Modifications of the apparatus may be used for superheating steam.

[Printed, 1*s*. Drawings.]

A.D. 1866, February 12.—N° 434.

ABEL, CHARLES DENTON. — (*A communication from Eugen Ladgen and Auguste Nicol Otto.*)—This is a gas engine, in which the explosion of a mixture of air and gas drives up a light piston provided with a rod, on which is a rack in gear with a spur wheel on the fly wheel shaft. The spur wheel is not fixed to the shaft, but so connected by means of a ratchet wheel or friction clutch mechanism that when made to revolve by the rising of the piston it turns freely on the shaft, but when made to revolve in the reverse direction it causes the shaft to turn with it. The piston is thus enabled to rise very rapidly, and before the heat generated by the explosion is dissipated. By the expansion and cooling of the products of the explosion a partial vacuum is formed, and the pressure of the atmosphere effects the return of the piston. By throttling the pipe for the escape of the products of explosion, the piston may be made to move more slowly so that a catch is not depressed at the proper moment, and the cams which regulate the entrance of the gas for a fresh up stroke will be kept stationary by which the piston can be made to perform any less number of strokes than the shaft performs revolutions in a given time.

In another modification, two piston rods connected by a piece, and imparting their motion to the shaft by means of an endless band which may be jammed tight between a plate and a slide are used. No. 2098, A.D. 1863, is referred to.

[Printed, 1*s*. 10*d*. Drawings.]

A.D. 1866, February 23.—N° 557.

PARKER, JAMES.—(*Provisional protection only.*)—This consists first, in improvements on the invention, No. 2620, A.D. 1863, which are using a condenser having a partial vacuum in which the steam or moisture, or a large portion of it, is condensed, and the air contracts and is drawn off by nozzles, and used to blow up the fire or increase the draught by being discharged up the furnace. The length of all the air nozzles described in the former Specification is increased. They are placed closer to the jet apertures, and a larger number of smaller jets is used. The steam and air pipe may be jacketed with steam instead of waste heat, and the atmospheric and vacuum pressures may be used separately. The vacuum pressure may be used in engines where steam, hot or compressed air, or gas may be objectionable, and the engines may be several miles distant from the boiler jets and nozzles, and will then be of great service for mining purposes, as the foul air will be drawn from the mine. If inflammable, it may be discharged into the fire of the boiler outside the mine, and used as fuel.

[Printed, 4*d*. No Drawings.]

A.D. 1866, March 6.—N° 684.

NEWTON, ALFRED VINCENT.—(*A communication from John Bowman Atwater.*)—This invention relates to a novel way of treating air to be used as a motive agent. Under certain circumstances, atmospheric air will not readily commingle with steam, hence air may be rapidly forced out of or compressed into a chamber by means of steam introduced into the chamber. In the engine described, a boiler, which may be a frustrum of a cone, communicates by a pipe with a revolving cylinder. A heating or rarefying chamber is placed above an opening in the centre of the boiler, by which the heated products of combustion from the fire chamber escape. This rarefying chamber also communicates with the revolving cylinder, which has three cells, each of which successively receives air through ports in fixed discs supporting the axis of the cylinder, effects a junction between the boiler and the rarefying chamber, and is brought opposite to the opening of a pipe for conducting off the exhaust steam. The steam is generated under a pressure of a pound to the square inch, and serves to drive air out of the cells into the rarefying chamber, and also to

communicate a certain amount of heat and qualities of moisture. The air is heated in the rarefying chamber and passes thence to work a hot air engine. Other contrivances for bringing air under the influence of steam, such as a vibrating segment with chambers, may be used.

[Printed, 1*s*. 6*d*. Drawings.]

A.D. 1866, March 13.—N° 752. (* *)

HORSTMANN, Fredrich Gustav Adolph. — (*Provisional protection only.*)—" New or improved mechanism for obtaining " motive power, particularly applicable for the self-winding of " clocks, time-pieces, and other machinery requiring winding."

A cylinder or tube contains a metallic piston, which forms a perfect float therein. The cylinder is in connection with a vessel containing naptha, or other fluid that is expansible by heat, " oily " matter being used therewith to prevent the evaporation of the " naptha." " The alteration of temperature acting upon this " fluid causes the same to expand or contract, as the case may be, " thereby causing the piston or floating bucket to rise and fall, " thus producing an impulse or motion either in a horizontal or " vertical direction." To the rod of the piston is attached a cross bar, which causes a drum " to revolve and carry an endless chain, " by preference formed of watch spring, this chain is passed over " the main wheel arbor or barrel of the clock so that it hangs in " a loop on either side thereof," and, to each of these loops, the inventor attaches " a weight for giving the necessary working " power to the clock and setting in motion the train of wheel- " work, and thus rendering the process of winding unnecessary. " The rack of the aforesaid piston or floating bucket is made " to work immediately upon a wheel in connection with a set " of wheels, pinions, springs, and drums, thereby rendering " the endless chain unnecessary when applied to time pieces or " mechanism of smaller construction."

The drawings show this invention applied to a clock.

[Printed, 8*d*. Drawing.]

A.D. 1866, March 17.—N° 804.

ZANNI, Geminiano.—(*Provisional protection only.*)—An air-tight drum is formed in two parts arranged to revolve together upon an axis as one drum, and formed so that when two of their

sectional surfaces on one side of the axis meet, an angular recess radiating from the axis to the periphery is left, causing the drum to be lighter on one side than on the other. The drum may be nearly submerged in water or other fluid, when the buoyancy of the air-tight sections will raise the central weighted parts of each section above the centre of gravity of the axis. The angular recess will be in the underside, and the parts being held in their position by a spring or catch, the whole has a tendency to revolve. When the heavy side has nearly reached the centre of gravity on the descending side, the catch is reclosed, and the buoyancy of the lower parts causes them to separate, thus again giving preponderance to the upper side of the rotating drum. The drum may also be caused to rotate in the air. The closing of the angular recess on the lower circumference by the gravitation of the parts in opposite directions causes a column of mercury or other fluid to be forced by gravitating pressure into a chamber opposite the upper circumference, thus giving a preponderence of weight to the upper side after each semi-rotation, or this may be given by pneumatic bellows, or a rack and pinion or other mechanism to raise a weight.

[Printed, 4*d*. No Drawings.]

A.D. 1866, March 20.—N° 819.

RAMSBOTTOM, John.—(*Provisional protection only.*)—Obtaining motive power from the compression and expansion of vapors of aqueous or other fluids.

Two vessels are employed, one of which answers the purpose of a low pressure boiler with a slightly weighted valve, so that the steam may escape readily when in excess of atmospheric pressure. This boiler heats the fluid, and contains vaporous pressure, enough to raise liquid to supply the second vessel. This vessel or converter is made of great strength. Above it is a chamber, having a valve with a cavity into which the liquid is raised from the boiler. The valve is then moved forward, until the cavity is brought over two orifices in the seating, both communicating with the convertor, by which the liquid is rapidly discharged into the convertor, where it is converted into vapor of high temperature and of regulated density. Vapor is conveyed from the convertor to the engine, and the exhaust vapour passes back to the low pressure boiler.

[Printed, 4*d*. No Drawings.]

A.D. 1866, April 23.—N° 1146. (* *)

HUCH, EDWARD HEINSON, and WINDHAUSEN, FRANCIS JOSEPH.—This invention, relating to a motive power engine, to be worked by steam or other fluid, consists of an ordinary steam cylinder, which is mounted and caused to revolve on its transverse axis or trunnions, which project respectively mid length from the two sides, and rest in suitable bearings. The axis on one side of the cylinder is hollow, and contains the steam ways which communicate with the two ends of the cylinder, the steam admisssion valves being arranged to cut off and work the steam expansively; the opposite trunnion or axis gives off the power. Within the cylinder there is fitted a heavy weight or piston, having no piston rod, and packed to slide steam tight to-and-fro from end to end of the cylinder. When the engine is at rest, the cylinder is placed in a vertical position by the piston weight, which sinks to the lower end of the cylinder vertically beneath the axis. Upon the steam being admitted under the piston, the latter is raised to the upper end of the cylinder, which, being inclined in the desired direction of motion, so as to bring the weight on one or other side of the vertical plane of the axis, acts as a weighted lever, and causes the cylinder to perform half a revolution, just before the completion of which the steam is again admitted to the lowest end, and the piston is again raised to the end which is uppermost, which in turn is brought down by the weight. By these means constant rotation of the cylinder is maintained. Suitable provision is made in the ends of the cylinder to receive and check the terminal momentum of the piston at the end of each successive upward course, and an apparatus for measuring exactly the quantity of steam required for each successive lift or stroke is introduced in the steam pipe. Modifications are shown and described.

[Printed, 1*s*. Drawing.]

A.D. 1866, April 28.—N° 1206.

NEWTON, HENRY EDWARD.—(*A communication from Marie Joseph Denis Farcot and Joseph Perrigault.*)—Rotatory motion.

"Steam or other motive fluid is caused to act upon a wheel, "provided with floats which are by preference set at an angle to "the periphery of the wheel. The steam or other motive agent is "supplied to the cylinder or casing through a pipe situate at the

" side and enters the spaces between the floats and acts upon
" them and passes into a steam chamber at the other side of the
" cylinder or casing, from whence it again passes between and acts
" upon the floats and into another chamber in the opposite side
" of the cylinder or casing, and thus the steam passes in a con-
" tinuous serpentine direction throughout or across the whole
" periphery of the cylinder or casing, entering chambers provided
" alternately at each side of the casing and acting successively
" upon the floats, thus imparting to the wheel a steady screw-
" like motion and causing the steam to act expansively throughout
" the whole of its passage to the exit pipe."

A modification consists in providing the wheel with a series of lateral oblique slots or hollow chambers, through which the steam passes in a serpentine direction. An arrangement is described where the motive ring is supported on friction rollers and the rotary motion transmitted to the machinery through a second wheel with teeth of any form.

[Printed, 1*s*. Drawing.]

A.D. 1866, May 8.—N° 1304.

ATKINSON, MATHEW HUTTON.—(*Provisional protection only.*) —" Valves suitable for steam, water, air, gas, and other motive " power engines."

As applied to an oscillating engine the ports are made on the face of the cylinder concentric with the axis of oscillation, and the valve which may consist of a disc or a portion of a disc made hollow, fits tight against the valve face, and has an inlet port passing through it from front to back, and exhaust ports opening from the face only to the internal cavity of the valve. This cavity opens either into a central pipe serving as the axis on which the valve turns when adjusted for reversing the engine, or into an opening communicating with a belt cast in the cylinder. The reciprocating motion of the valve is effected by a lever and eccentrics, or the valve is fixed by the reversing lever, and the change of ports effected by the oscillation of the cylinder. The valve is surrounded by a steam chest, on which is a tubular collar concentric with the stem, a steam place being left between the two. This collar forms the trunnion.

[Printed, 4*d*. No Drawings.]

A.D. 1866, May 15.—N° 1385.

NICHOL, Bryce Grey.—(*Provisional protection only.*)—Rotary engines.

A horizontal driving shaft is connected to a cylinder, to which a piston consisting of metallic pieces and packing is fixed and the whole is placed within a large cylinder, on each side of which is a horizontal slide valve or stop to admit and cut off the steam, and also act as bearings between the steam and piston. The steam or other motive agent on entering bears upon one slide and forces the piston round to the opposite slide. As the piston approaches, this slide is forced back by an eccentric or tappit motion, and the first slide is made to advance by the action of a spring. The valves change their position and the motive agent acts on the advanced valve and the piston so that a continuous rotary motion is obtained.

[Printed, 4*d*. No Drawings.]

A.D. 1866, May 17.—N° 1401.

BERNARD, Julian.—(*Letters Patent void for want of Final Specification.*)—Engines worked by compressed air are used in a mine, and are made with chambers containing water or other fluid opening directly into the cylinder so that both sides of the piston are exposed and covered by the liquid. Pumps are worked by such engine or may be used as motive power cylinders. One or more are situate beneath a lever or segment, and their plungers or pistons connected by chains or otherwise to the opposite ends of the lever. Air is admitted through a valve to one side of the plunger and depresses it, and at the same time raises that or those on the opposite side, filling the barrel or barrels with water while the water in the barrels in which the plunger is depressed is expelled. The air is thus alternately admitted to one side of the plunger by valves actuated by the motion of the plunger in each barrel, and the pumps thus become capable of performing operations where power is required.

[Printed, 4*d*. No Drawings.]

A.D. 1866, May 17.—N° 1402. (* *)

BEALE, John.—Rotary engine, capable, when actuated by steam *or fluid* pressure, of yielding motive power, and when driven by

other power, of acting as a pump. The engine comprises "an " outer casing or cylinder, furnished with an inlet and outlet as " usual. Within this outer casing is fitted a revolving drum, the " axle of which passes through a stuffing box, at each end or at " one end only, and is carried on antrifriction rollers or otherwise. " This revolving drum is mounted so as to be excentric in relation " to the outer casing or cylinder, and is slotted to allow two " pistons or partitions (connected so as to act as one) to slide in " the drum in such a man ner that the outer ends of the piston " or partitions may be always kept in contact with the interior of " the stationary casing or cylinder. One of the pistons or par- " titions is larger than the other, the smaller piston being inserted " in a slot formed at one end of the larger piston. By this con- " nection of the two pistons respectively the smaller becomes an " elongation of the larger, and they together constitute one piston " or partition extending across the whole interior of the stationary " case or cylinder. The larger piston is connected at one end by " means of pins with rings capable of revolving in annular " grooves formed in the end plates of the stationary case or cylin- " der, and the smaller piston (at the reverse end of the larger) " is similarly connected with guide blocks, which work within " curvilinear grooves or slots in the said rings."

When the axle and drum revolve, the latter carries round the sliding pistons, which move to-and-fro diametrically in the drum, their ends or outer edges being kept in constant sliding contact and steam-tight against the internal surface of the cylindrical case, the larger piston being actuated radially by the pins which fit into eyes in the rings, and the smaller piston by the segmental sliding guide blocks, which work in the segmental grooves sunk respectively in the inner face of the rings.

The frictional parts are suitably packed and ordinary slide valves are fitted for admitting steam and reversing motion.

[Printed, 10*d*. Drawing.]

A.D. 1866, May 19.—N° 1422.

SEMPLE, Matthew.—Motive power is obtained from the weight of an engine by mounting one or more wheels upon a hollow axle communicating with a reservoir for compressed air. Tubes of vulcanized india-rubber or other flexible material of, say, say ten inches in diameter are secured round about half the

periphery of the wheel and the ends are connected to the hollow axle. Similar tubes are secured to the other half of the periphery. The whole wheel is fitted inside a wheel of larger diameter and bears on its inner periphery. The tubes are fitted with valves through which the air enters and, as the inner wheel revolves, is compressed and forced to the reservoir and thence supplied to the cylinders of the engine. Another arrangement consists in having cylinders fitted to the wheels, and provided with pistons actuated from the centre or other part of the wheels or axles, either vertically or laterally by eccentrics or otherwise. These pistons serve to force air into the reservoir.

[Printed, 10*d*. Drawing.]

A.D. 1866, May 23.—N° 1451.

DOUGLAS, SHOLTO.—This consists of one or more wheel or wheels rotating on an axle within a cylinder or case. On the circumference, or in the body of the wheel curved or **U**-shaped passages are made. The motive agent, whether steam, compressed air, gas, water, or other liquid or fluid, is admitted into the casing, and, entering the ends of the passages, passes to the centre of the wheel, causing it to revolve. The motive agent thence passes to the centre of a second wheel fixed on the same axle as the first, and, by centrifugal action, is impelled to the ends of the curved passages. It may afterwards pass over or under a diaphragm to the outside of a third wheel, and by a second central passage to a fourth wheel. The number of wheels may be increased or diminished according as power or speed is required. Where high speed is required, a single wheel is advantageous.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1866, June 27.—N° 1714.

JORDAN, JOHN.—(*Provisional protection only.*)—This consists in using "alcohol, ether, pyroxylic spirit, or naptha, or methylated "spirit," either in engines of the ordinary construction with surface condensers or by vaporizing them in a vaporizer heated by aqueous vapor produced in a boiler with a continuous circulation of the water contained, and conducting the spirit vapor to an aquous steam-jacketed cylinder, and thence to a surface condenser, from which it is re-conducted to the vaporizer.

[Printed, 4*d*. No Drawings.]

A.D. 1866, July 14.—N° 1848.

JUSTICE, William.—Engines to be driven by water, steam, or compressed air or gas. These consist of a chamber in which three revolving cylinders are placed. Their axles pass out of the chamber, and at one end are groved into each other by spur wheels or pinions. The outer cylinders are both formed with a tongue which bears continually on the inner face of the chamber or case, and is received into a recess in the central cylinder. The actuating liquid or fluid may be admitted through the hollow axles either of one or both outer cylinders, and will then press forward the tongues; the central cylinder rotating in contact with the outer cylinders, and forming a continuous abutment. The liquid or fluid afterwards escapes through ports in the outer case. In another modification the central cylinder is dispensed with. The two pistons roll on each other forming a mutual abutment, and the steam is admitted in one cylinder only, and fills the space between the two tongues, causing the cylinders to rotate in opposite directions.

[Printed, 1*s.* 2*d.* Drawings.]

A.D. 1866, July 21.—N° 1899.

VON RATHEN, Anthony Bernhard Baron, and ELLIS, George Henry.—(*Provisional protection only.*)—This may be considered as supplementary to No. 818, A.D. 1865. It consists in providing a motive power wheel, having its axis upon fixed bearings in an eccentric position, and turning in an oscillating cylinder. The compressed air or water is introduced into closed chambers formed upon the longest arm of the power wheel. A rod is fixed to one end of the cylinder, and gives motion to a piston.

[Printed, 6*d.* Drawing.]

A.D. 1866, July 25.—N° 1927.

PRINCE, Henry.—A wheel fitted on a shaft is made with two sides, each having a boss or rim and radial arms, the opposite arms of each side being connected by transverse rods, to which is attached an air bag conveying a weight and furnished with a spring valve. Each air bag communicates with one on the other side of the axle. The wheel is mounted in a tank filled with water, and the bags on one side being filled with air and kept open

[...] weights, while those on the other are closed by [...], the wheel will revolve. Hydrogen gas may be used [...] of air. By having two air bags attached to each spoke of [...]wheel, and a weight arranged so as to close the lower while [...]ing the upper bag, the wheel may be made to turn [...]out water by the addition of two air bag reservoir cylinders. [...]e air discharged from the bags being sent to the cylinders [al]ternately.

[Printed, 1s. 4d. Drawings.]

A.D. 1866, July 26.—Nº 1946.

ADAMS, THOMAS.—(*Provisional protection only.*)—The invention consists in an arrangement in which the force applied is such that the resistance to that force is neutral with respect to the axis of motion of the engine, thus leaving the force available to produce motion. A stationary cylinder or sphere is made with a piston and connecting rod "in such a manner that the force constituting the motive power is admitted through the centre "of motion and conveyed into the space enclosed between the "piston and crank on one or more sides of the centre of motion, "and is made to act on the crank and piston through the "particular angle of the connecting rod on any desired point of "application relative to the centre of motion, while the resistance "to such force is taken upon the cylinder or sphere, which is the "stationary body." The force may be made to act on the work either in, through, or about the centre of motion.

[Printed, 4d. No Drawings.]

A.D. 1866, August 4.—Nº 2011.

PRATT, CALEB, and PRATT JOSIAH.—This consists of an engine moved by compressed air combined with the vapour of water. The engine is furnished with two reservoirs for compressed air, the lower parts of which are heated by furnaces, while the upper parts are kept cool. The compressed air is driven from one end to the other by pistons in the form of buckets containing cold water, which are suspended from a beam. They have a slight packing to prevent the water from falling to the bottom. The working cylinder is formed in two parts, bolted together; a packing ring is placed at the junction. The piston is made as thic[k] as the length of its stroke, and does not touch the cylinder, b[...] [...]ing tight only at the packing is driven as a bolt to and [...]

When the working piston is near the end of its stroke a communication is opened between the reservoirs so as to transfer the excess of pressure in the reservoir which has just ceased its effect on the piston to that which is about to commence its effect. This is done by the equation valve, which should be in duplicate. The buckets are supplied with water, which enters like rain at the moment of least pressure. The surplus runs off when the bucket is on the up stroke by an annular channel at the upper end of the reservoir. These channels open into two stand pipes, one containing a float attached to a slide valve for the escape of the water. The other has three cocks, the two lower open when the upper one is closed, and the water in the pipe is consequently replaced by air from the atmosphere. When the pressure in the reservoir is greater than in the stand pipe, water will be forced into the latter, and the pressure equalized, and, when the pressure in the reservoir falls, the air in the pipe will be inspirated.

[Printed, 2*s*. 6*d*. Drawings.]

A.D. 1866, August 20.—N° 2137.

JOHNSON, John Henry.—(*A communication from Jean Baptiste Dubreuil and Camille Bernard.*)—(*Provisional protection only.*) —Centrifugal apparatus is arranged so as to increase the power of any prime mover. Two rotating shafts in the same vertical plane are employed. One is rotated by the prime mover, and imparts a rotary motion to one or more weighted bars revolving on axes situated in the circumference of a circle, the centre of which coincides with the centre of rotation of the second shaft. This is in connection with and rotated by the centrifugal force developed by the rotation of the weighted bars, which are free to rotate, whether the second shaft be revolving or not, so that the resistance can be overcome solely by the centrifugal force produced, and not by the prime mover, whose function is simply the rotation of the bars.

[Printed, 4*d*. No Drawings.]

A.D. 1866, August 23.—N° 2164.

GERARD, Aristide.—(*Provisional protection only.*)—Motive power engine consisting of two cylinders filled with liquid placed vertically one above the other and connected by uprights which are perforated in the centre for the passage of the pivots of a shaft forming one piece with the uprights. Each cylinder contains a

float whose rod works a crank and by means of a ratchet wheel moves a loose pulley always in one direction. The floats rise through the liquid, and when their movement is over the apparatus is turned over so that the floats are ready to begin again. The rupture of equilibrium may be effected in various ways, one of which is to fill a cupola attached above the cylinders with water flowing from a tub. The cupola turns over and discharges its contents into a second which also turns over. In an apparatus in which the cylinders are placed side by side, and each contain two floats, tubes are attached to such floats, which being forced or drawn by the floats produce the rupture of equilibrium.

[Printed, 1*s*. Drawings.]

A.D. 1866, September 10.—N° 2330. (* *)

BENNETT, Robert.—(*Provisional protection only.*)—" Modes " of obtaining and transmitting motive power, and in the machi- " nery or apparatus employed therefore."

" The essential feature for this my invention consists in alter- " nately increasing and diminishing the area of the piston and " cylinder or pistons and cylinders, or acting surfaces at the ends " of their strokes (or at the time the crank is turning the other " two 'dead' centres in a line with the axis of the moving piston " or cylinder), so as to act upon and move the actuating surface, " for the time being, with a proportionately greater force in the " direction of motion than in the reverse direction equal to the " said difference made or caused in the area of the actuating " surfaces, and the pressure of steam acting thereon above that " of the atmosphere, and by this means keeps the direct pressure " of the steam or other fluid power employed constantly acting " within the cylinder or cylinders, as the case may be, without " any great or essential escape of the acting fluid or heat there- " from." Although this engine is described in the form necessary for use where steam is employed as the motor, yet the invention also includes the employment of air, water, or other fluid.

[Printed, 4*d*. No Drawings.]

A.D. 1866, September 13.—N° 2353. (* *)

HORSTMANN, Fredrich Gustav Adolph.—"This in- " vention consists in obtaining motive power from the expansion " and contraction of mercury, spirits of wine, glycerine, and other

" spirits and expansive liquids," as described in a prior invention, No. 752, A.D. 1866, but a more extended application of this power is here claimed.

A cylinder carries a piston which rises and falls as the temperature makes the fluid contract or expand. The rod may be attached to bars from the windows of greenhouses, so that the windows are opened or shut according to the temperature of the atmosphere.

In clocks and watches a metallic piston is pressed home on the fluid by a spring " the alternation of temperature acting upon " this fluid causes the piston rod carrying a cross bar to work " up and down." A chain is connected at one end to the cross bar and at the other to a hollow revolving drum " containing a " strong spring for regulating the back pressure of the piston;" on the outside of the drum, and in gear therewith, is a second drum wheel, over which a second endless chain is passed, " which " is then passed over the main wheel arbour of the clock, and " hangs down on either side thereof in a loop." To each loop is attached a weight, one larger than the other. When the large weight has been raised to its greatest height by the expansion of the fluid, it raises a lever, releases a catch, and leaves the spring drum to revolve alone as the piston ascends or descends; the weight is then free to descend, rendering the process of winding unnecessary.

The rack of the piston " can be made to work immediately upon " a wheel in connection with a set of wheels, pinions, springs, " and drums, thereby rendering the endless chain unnecessary."

[Printed, 8*d*. Drawing.]

A.D. 1866, September 15.—N° 2377.

VON RATHEN, Anthony Bernhard, Baron.—This is a new mode of constructing the power wheel, and differs from that patented No. 818, A.D. 1865, by the compressed air forming a floating mass round the wheel between it and the internal surface of a cylinder. The wheel contains two cavities on opposite sides, each having a part of the diameter projecting, under which is a cavity with metal pieces arranged so that the reactive power pressing on it is counterbalanced by the power pressure on the opposite similar cavity. Several modes of effecting this are described.

The wheel revolves on its axis closed in by the cover as by a box. The only part of the cover which is left to be made air tight is round the axle at its exit from the cylinder. A space is left between the axle and the cover which is closed by a ring or collar, which turns on the shoulder of the cover. Round this projection of the cover packing is wound and is fastened by a buckle or screw ring. The axle may also be packed by stuffing boxes.

[Printed, 3*s.* 10*d.* Drawings.]

A.D. 1866, September 28.—N° 2508.

JOHNSTONE, JOHN STUART.—Motive power is produced by the property of a compound bar formed of two bars of metal of different expansive powers, to assume a curved form when heated several sets of compound bars or plates (preferably composed of brass and iron) are arranged in parallel rows in a framework fixed to a strong bed plate. Each bar or plate having a short space between it and the adjacent one, and the two bearing at their central parts on a piece of metal. In each compartment the bars are set reversed to the bars in the next preceding compartment, so that the heated bars curve in opposite directions. A set of bars being heated, and one end being supported against a bearer, the free end and the metal plate between it and the second set will be projected forward, and the second set being also heated, its plate will be projected double the distance of the first and so on, so that any length of stroke may be obtained by increasing the number of sets. Two chambers are used, one of which is being heated by means of heated air, while the other is being cooled by a fan. The reciprocating motion is converted into a slow rotation of a shaft provided with a large spur wheel gearing into a pinion, whose shaft carries a similar spur wheel which actuates a pinion on a driving shaft, whose rate of revolution is thus rendered sufficiently quick for a useful motive power engine.

[Printed, 1*s.* 6*d.* Drawings.]

A.D. 1866, October 8.—N° 2590.

NEWTON, WILLIAM EDWARD.—(*A communication from David Dick.*) — "Atmospheric engines," which are provided with a generator having a central shaft bearing a ring or valve plate, which vibrates from one side to the other of a stationary plate. Below the generator is a closed chamber charged with a supply

of oil or other combustible material from any suitable reservoir. A section is cut from the bottom of the generator and is attached to a shaft in the centre of the closed chamber. To the other side of this shaft is secured a tube wrapped with loose fibrous material. By the revolution of the shaft the section is moved to the bottom of the closed chamber and the tube with its wrapping saturated with oil lifted into the generator, when the oil is ignited by means of a pipe with a piston carrying some very inflammable substance, gun cotton or a fulminate. The heated air passes through valves at the top of the generator to the working cylinder. The air in the generator is reversed by the action of the plate valve. In another description of engine there are two generators with plungers attached to the ends of a beam and having conical projections, covered with some absorbent material which are dipped into conical vessels filled with oil below the generators.

[Printed, 1*s*. 2*d*. Drawings.]

A.D. 1866, October 11.—N° 2633.

MESSER, HENRY.—(*Provisional protection only.*)—Improvements in heated air engines. The furnace is constructed with an outer casing of iron, having a lining of fire-clay, near the top of which a passage way is formed communicating with the interior by a series of small holes converging to the centre of the furnace. The air is admitted to the furnace through these holes. Air passages communicating with the ash pit and by an annular space with the interior of the furnace, and are provided with dampers by which the course of the air may be directed into the ash pit or into the furnace above the fuel. The supply pipe leading to the valve chest is made with a U-shaped bend to secure a more perfect combustion of the products of the fuel. A mode of driving the governor to regulate the speed of the engine by a cord extended to any part of the building is also described.

[Printed, 4*d*. No Drawings.]

A.D. 1866, October 24.—N° 2744.

WATTS, JOSEPH.—Improvements in furnaces.

Part of the invention consists in obtaining motive power from the atmospheric air supplied to furnaces by fans placed in the passage through which the whole of the air required for combus-

tion passes. The quantity of air passing through the pipe or passage may be regulated by a slide or throttle valve.

[Printed, 1*s*. 2*d*. Drawings.]

A.D. 1866, October 31.—N° 2824.

NEWTON, WILLIAM EDWARD.—(*A communication from John Robertson Cameron.*)—Vacuum air engine which is furnished with a heated air chamber containing a fire-box, and a vacuum chamber with a thin lining inside and a water space between this and the outside casing. Water is supplied to this space from a cistern through pipes furnished with valves which open and shut so as to prevent the atmospheric pressure acting on the water in the water space. The fire-box is made to descend into the vacuum chamber, driving out the air part through the top of a bellows into the fire in the box, and part into the heated air chamber. The fire-box afterwards reascends to the heated air chamber, the movement being aided by a spring in the vacuum chamber. A vacuum is thus formed in the chamber, and this being made to communicate with the working cylinder, its piston is driven by the atmospheric pressure and the vacuum chamber is at the same time refilled with air.

[Printed, 8*d*. Drawing.]

A.D. 1866, November 19.—N° 3029.

BERNARD, JULIAN.—(*Letters Patent void for want of Final Specification.*)—Motive power engines for mining purposes.

Under one modification an engine is made with chambers containing water or other fluid at one or both ends of the cylinder, and the piston in working is covered on both sides by such fluid and is driven by compressed air. The engine works pumps from the piston rod or other reciprocating part. In another modification the pumps can themselves be used as motive power engines. One or more pumps are situated beneath, and their pistons or plungers connected to the ends of a lever or segment. Valves admit air to one side of one plunger, the air causes it to descend, and at the same time raises that on the opposite side, filling the barrels with water whilst the water in the barrels in which the piston has been depressed is expelled. The valves are actuated by the motion of the piston.

[Printed, 4*d*. No Drawings.]

A.D. 1866, November 27.—N° 3125.

GEORGE, RICHARD.—(*Provisional protection only.*)—This is for improvements in engines where motive power is obtained by the action on a piston traversing to and fro within an oscillating or vibrating cylinder.

The cylinder may oscillate upon a cylindrical tube or the tube may be fixed to and oscillate with the cylinder. In the first longitudinal admission and exit ports are made in the tube which is constructed with partitions to prevent the exhaust steam, air, gas, or vapour mingling with that to be admitted to the cylinder. An auxiliary valve is employed for cutting off the steam at any part of the stroke, or in order to close all communication at the time of the explosion of gas. This valve consists of a plate of metal with a rod which works upon the face of the diaphragm. When the tube and cylinder oscillate together, orifices at the extremity of the former work against ports in hollow studs or brackets. An apparatus for exploding gas by means of an electric igniter consists of two wires insulated by some non-conducting substance, to one of which is transmitted electricity from the positive-pole of a battery by means of an insulated metallic "pointer," which revolves against circular metallic plates charged with electricity from the positive pole, the other wire communicates with a metal plug.

[Printed, 4*d*. No Drawings.]

A.D. 1866, December 5.—N° 3207.

CLARK, WILLIAM.—(*A communication from Auguste Gerin.*)—This invention consists in a rotatory engine driven by steam, gas, or other power by means of sixteen pistons working in small cylinders or enlargements of a circular disc whose boss is keyed on the main shaft. The cylinders are disposed at an angle with the radius of the disc, and the pistons of the opposite cylinders are connected by metallic cords, so that when one rises the other is drawn back into its cylinder. The distributing chamber is made moveable so as to adjust its position to compensate for the wear produced by friction, and fix it in the most suitable position.

[Printed, 8*d*. Drawings.]

A.D. 1866, December 20.—N° 3344.

GEDGE, WILLIAM EDWARD.—(*A communication from Auguste Chenille.*)—Locomotive machinery without steam.

A vertical iron shaft supports a lever furnished with three moveable pendants or connecting rods. One of these is connected to a fly which the driver turns, and thereby lifts the 3rd connecting rod to which is fitted a T-shaped crank traversing two boxes containing springs. At the same time the middle connecting rod is lowered and a compass on it, each branch of which receives an axle with a crank, opens its branches, and gives half a turn to two pairs of driving wheels. The return movement of the beam brought back by the motive power produced by the springs, causes the wheel to make another half turn. The driver must continue to follow the movement of the fly until the impulsion is superior to the motive power. In screw boats the shaft is lateral, and the compass placed laterally to the fly, and has one of its branches fixed; the other will give impulsion to the fly.

[Printed, 1*s*. Drawings.]

A.D. 1866, December 21.—N° 3363.

ANDERSON, James.—This is an improvement on the invention No. 2767, A.D. 1859, and consists in connecting the piston with a shield or series of shield shells, and also in employing a porous block as a regenerator or economiser of heat. The block is made to move up and down at suitable intervals, and is provided at its lower surface with a diaphragm furnished with valves. The combustible gases are introduced between the diaphragm and the block, and are made to traverse the block before they are ignited. After the piston has been driven forward by the expansion of the gases, the exhaust gases are driven through the block and to the lower side of the diaphragm and pass out by valves at the base of the cylinder.

[Printed, 8*d*. Drawing.]

A.D. 1866, December 22.—N° 3373. (* *)

SLOPER, Joseph.—(*Provisional protection only.*)—" Improved " means of and apparatus for obtaining motive power, applicable " for driving machinery, and for ventilating mines, buildings, " ships, and and other spaces." " I create or produce a powerful " current or currents of air by the means of one or more shafts " built in the usual way of brick or stone, or tubings of metal or " other material, that in proportion to the height or length of the " shafts, funnels, or tubings so the currents of air are increased,

" provided that the inside of the shafts, funnels, or tubings are of " the proper proportion;" " or I propose ascending funnels or " tubes made of any suitable material, and to connect and con- " tinue from the lower part thereof, if desirable, a continuous " length of conduits or tubings in a longitudinal position along " the ground, or in any direction found most suitable, so as to " catch the air and create the most powerful current or currents " of air through the tubing and up the ascending shafts or " funnels."

" Having got my moving power, I propose to a affix or attach at " the upper part or outlets of the funnels or shafts my apparatus " or machinery, which consists chiefly of revolving fans, that is, " fans or vanes attached to a central drum, main shaft, or spindle " axle working on centres horizontally or otherwise; or my appa- " ratus may be placed within the shaft or funnel, or in such a " position as by the current of air passing up or from the shaft " or funnel the current of air will cause the fans to revolve with " great velocity, and thus communicate a rotary motion to the " central main shaft, which motion is transmitted by means of " gearing to the machinery it is intended to actuate."

" I intend at the lower part or entrance of the tubing, where " the mouth or entrance is properly constructed, to fix or attach " another revolving fan of a similar kind as before described (if " necessary) working either horizontally or otherwise, for the " purpose of increasing the current of air through the tubings, " with other contrivances inside the tubings or funnels, if neces- " sary, for increasing the power, and also apparatus for regulating " the currents of air, or for the purpose of stopping the machinery " or setting it in motion; and I propose (if necessary) to add " upright or vertical apparatus, with revolving fans attached to a " central drum or shaft, and arranged or fixed in such a position " that the wind shall act freely on the fans, which fans will rotate " and this power may be transmitted by means of toothed wheels " and other gear as an auxiliary power to the other machinery " acted on by the currents passing through the tubings or shafts."

[Printed, 4*d*. No Drawings.]

A.D. 1866, December 31.—N° 3448.

CLARK, William.—(*Provisional protection only.*)—Improvements in the manufacture of hydrogen gas, and its applications for lighting and heating, and as a motive power.

The gas is produced by passing carbonic acid over carbon heated to redness, and acting on the carbonic oxide thus produced by super-heated steam in a retort heated to redness. In this way hydrogen and carbonic acid are produced, and are afterwards separated. For heating purposes, an inclosed space divided into three parts on the Davy principle is used. Hydrogen is introduced into the lowest, and oxygen into the central part. The upper contains the two electrodes of a pile which produces sparks, the intervals of contact being regulated by a pendulum. A pipe from the upper part dips into water, and communicates with a ball for receiving the unconsumed hydrogen. In boilers, the waste heat is used for producing hydrogen. For motive power, an ordinary surface or other condenser is applied to gas engines operated by the combustion of hydrogen, whether by acting on a piston, or the vanes of a turbine, or serving to rarefy air in closed chambers. The hydrogen serving simply to rarefy the azote for the production o condensible steam, will nearly double the power of gas engines when combined with a condenser. Another advantage is that of dispensing with all cooling currents, the lowering of the temperature being produced by communication with the condenser, whose temperature will be from 90 to 100 degrees.

[Printed, 1*s.* 10*d.* Drawings.]

INDEX OF SUBJECT MATTER.

[The numbers refer to the pages in which the Abridgments commence. The names printed in *Italic* are those of the persons by whom the inventions have been communicated to the Applicants for Letters Patent.]